SPORTON LAB.

Project No : ER232843-13AC

VERIFICATION OF COMPLIANCE

Equipment : **802.11abgn, USB module**
Model No. : **WUBR-508N**
Applicant : **SparkLAN Communications, Inc.**
8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei City 11493, Taiwan

SPORTON LAB

I HEREBY **DECLARE THAT :**

The following technical requirements and test specifications are relevant to the presumption of conformity under the **R&TTE Directive 1999/5/EC(until 12 June 2016) and Directive 2014/53/EU (from 13 June 2016)**.
The equipment was **Passed** the test performed according to
ETSI EN 300 328 V1.9.1 (2015-02)
The test was carried out on **Oct. 03, 2015** at **SPORTON INTERNATIONAL INC.** LAB.

Kevin Liang
Kevin Liang
Assistant Manager

CE Test Report

Equipment	:	**802.11abgn, USB module**
Brand Name	:	**SparkLAN**
Model No.	:	**WUBR-508N**
Standard	:	**EN 300 328 V1.9.1 (2015-02)**
Operating Band	:	**2400 MHz – 2483.5 MHz**
Applicant		**SparkLAN Communications, Inc.**
Manufacturer		8F., No. 257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan

The product sample received on May 26, 2015 and completely tested on Oct. 03, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in EN 300 328 V1.9.1 (2015-02) and shown compliance with the applicable technical standards. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation: Directive 1999/5/EC (until 12 June 2016) and Directive 2014/53/EU (from 13 June 2016).

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Kevin Liang / Assistant Manager

Testing Laboratory
1190

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Summary of Test Result

Harmonized Standard Requirements and Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
3.1	4.3.2.2	RF Output Power	EIRP [dBm]: 19.92	20 dBm	Complied
3.2	4.3.2.3	Power Density	EIRP PSD [dBm/MHz] 8.85	10 dBm/MHz	Complied
-	4.3.2.4	Duty cycle, Tx-Sequence, Tx-gap	Adaptive w/o test	EN 300 328 Clause 4.3.2.4.3	N/A
-	4.3.2.5	Medium Utilisation	Adaptive w/o test	MU > 10%	N/A
3.3	4.3.2.7	Occupied Channel Bandwidth	OCB fall in band Bandwidth [MHz] FL : FH :	Fall in band	Complied
3.4	4.3.2.8	Transmitter unwanted emissions in the OOB domain	2484.0 MHz -23.01 dBm (Margin 13.01 dB)	EN 300 328 Figure 3	Complied
3.5	4.3.2.9	Transmitter unwanted emissions in the spurious domain	[e.r.p.]: 598.420 MHz -72.62 dBm (Margin 18.62 dB)	EN 300 328 Table 4	Complied
4.1	4.3.2.10	Receiver spurious emissions	[e.r.p.]:6369.75 MHz -50.11 dBm (Margin3.11 dB)	EN 300 328 Table 5	Complied
5.1	4.3.2.6 4.3.2.11	Adaptivity Receiver Blocking	COT: 12.499 ms Idle: 0.042 ms	IEEE 802.11 IEEE 802.11n	Complied

Revision History

Report No.	Version	Description	Issued Date
ER232843AC	Rev. 01	Initial issue of report	May 15, 2012
ER232843-05AC	Rev. 01	Update standard version to EN 300 328 V1.8.1 (2012-06)	Nov. 13, 2014
ER232843-13AC	Rev. 01	Update standard version to EN 300 328 V1.9.1 (2015-02)	May 16, 2016

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Frequency (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**EIRP - Output Power (dBm)**
2400-2483.5	b	2412-2472	1-13 [13]	1	19.52
2400-2483.5	g	2412-2472	1-13 [13]	1	19.71
2400-2483.5	n (HT20)	2412-2472	1-13 [13]	2	19.77
2400-2483.5	n (HT40)	2422-2462	3-11 [9]	2	19.92
Note 1: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 2: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Information

Antenna Category	
☒	Integral antenna (antenna permanently attached)
	☒ Temporary RF connector provided
	☐ No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.

Antenna General Information			
No.	**Ant. Cat.**	**Ant. Type**	**Gain (dBi)**
1-2	Integral	Printed	3.79

Remark:
1. In modulation mode 11b and 11g, this EUT supports diversity. EUT was pre-tested Antenna Port 1 and Antenna Port 2 for single chain, and the worst case was Antenna Port 1. Therefore only the test data (Port 1) was recorded in this report.
2. In modulation mode 11n, this EUT only supports 2TX.

1.1.3 Type of EUT

Identify EUT	
Software / Firmware Version :	5.1.19.0
Presentation of Equipment	☒ Production ; ☐ Pre-Production ; ☐ Prototype
Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: …
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: …
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☐ Operated normally mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 100.00% - IEEE 802.11b	0.00
☒ 100.00% - IEEE 802.11g	0.00
☒ 100.00% - IEEE 802.11n (HT20)	0.00
☒ 100.00% - IEEE 802.11n (HT40)	0.00

1.1.5 Medium Access Protocol

Medium Access Protocol		
Medium Access Protocol:	☒	IEEE Std. 802.11-2007
	☒	IEEE Std. 802.11n-2009
	☐	IEEE Std. 802.15.4-2006
	☐	IEEE Std. 802.15.1-2005
	☐	Other:
A medium access protocol has been implemented by the equipment. With mechanism designed to facilitate spectrum sharing with other devices in a wireless network. The equipment implements an adequate spectrum sharing mechanism and users will be equal access wireless network.		

1.1.6 EUT Operational Condition

Supply Voltage	☐ AC mains	☒ DC	
Type of DC Source	☐ Internal DC supply	☒ From system	☐ External DC adapter
Test Voltage	☒ Vnom (5 V)		
Test Climatic	☒ Tnom (20°C)	☒ Tmax (50°C)	☒ Tmin (0°C)

1.1.7 Adaptive Equipment

Adaptive Equipment		
☐	non-Adaptive Equipment:	
	The maximum RF Output Power (e.i.r.p.): … dBm	
	The maximum (corresponding) Duty Cycle: … %	
☒	Adaptive Equipment without the possibility to switch to a non-adaptive mode:	
	☒	The equipment has implemented an LBT based DAA mechanism:
		☐ The equipment is Frame Based equipment
		☒ The equipment is Load Based equipment
		☐ The equipment can switch dynamically between Frame Based and Load Based equipment
	☐	The equipment has implemented an non-LBT based DAA mechanism
	☐	The equipment can operate in more than one adaptive mode
☐	Adaptive Equipment which can also operate in a non-adaptive mode	

1.2 Support Equipment

Support Equipment - RF Conducted			
No.	**Equipment**	**Brand Name**	**Model Name**
1	Notebook	DELL	E5540
2	Adapter	DELL	LA65NM130

Support Equipment - Radiated Emission			
No.	**Equipment**	**Brand Name**	**Model Name**
1	Notebook	DELL	E5540
2	Adapter	DELL	DA90E3-00

Support Equipment – Adaptivity			
No.	**Equipment**	**Brand Name**	**Model Name**
1	AP (Master)	Inteno	CG300
2	NoteBook	DELL	Latitude E5510
3	Adapter	DELL	DA65NM111-00
4	NoteBook	DELL	Latitude E5530
5	Adapter	DELL	DA65NM111-00
6	NoteBook	DELL	Latitude E5560
7	Adapter	DELL	LA65NM130

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- EN 300 328 V1.9.1 (2015-02)

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973			
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	
RF Conducted		TH01-HY	Candy	23.4°C / 58.7%	
Radiated Emission		05CH01-HY	Jerry	24.5°C / 65%	
Adaptivity Site		DFS01-HY	Ben	25°C / 60%	

1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty			
Test Item		**Uncertainty**	**Limit**
Radio Frequency		±0.6%	±5 %
RF output power, conducted		±0.1 dB	±1.5 dB
Power density, conducted		±0.6 dB	±3 dB
Unwanted emissions, conducted	30 – 1000 MHz	±0.56 dB	±3 dB
	1 – 12.75 GHz	±0.5 dB	±3 dB
All emissions, radiated	30 – 1000 MHz	±2.3 dB	±6 dB
	1 – 12.75 GHz	±2.6 dB	±6 dB
Temperature		±0.8 °C	±1 °C
Humidity		±5 %	±5 %
DC and low frequency voltages		±0.9%	±3 %
Time		±1.4 %	±5%
Duty Cycle		±0.6%	±5 %

2 Test Configuration of EUT

2.1 The Worse Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**
11b,1-11Mbps	1	1-11 Mbps	1 Mbps
11g,6-54Mbps	1	6-54 Mbps	6 Mbps
HT20,M0-15	2	MCS 0-15	MCS 0
HT40,M0-15	2	MCS 0-15	MCS 0

2.2 The Worse Case Power Setting Parameter

The Worst Case Power Setting Parameter (2400-2483.5MHz band)							
Test Software/Version	RT5x7x QA _V1.0.5.9						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		
		2412	**2442**	**2472**	**2422**	**2442**	**2462**
11b	1	0C	0C	0C	-	-	-
11g	1	12	12	12	-	-	-
HT20	2	0C,0A	0C,0A	0C,0C	-	-	-
HT40	2	-	-	-	0C,0B	0C,0B	0C,0C

2.3 The Worst Case Measurement Configuration

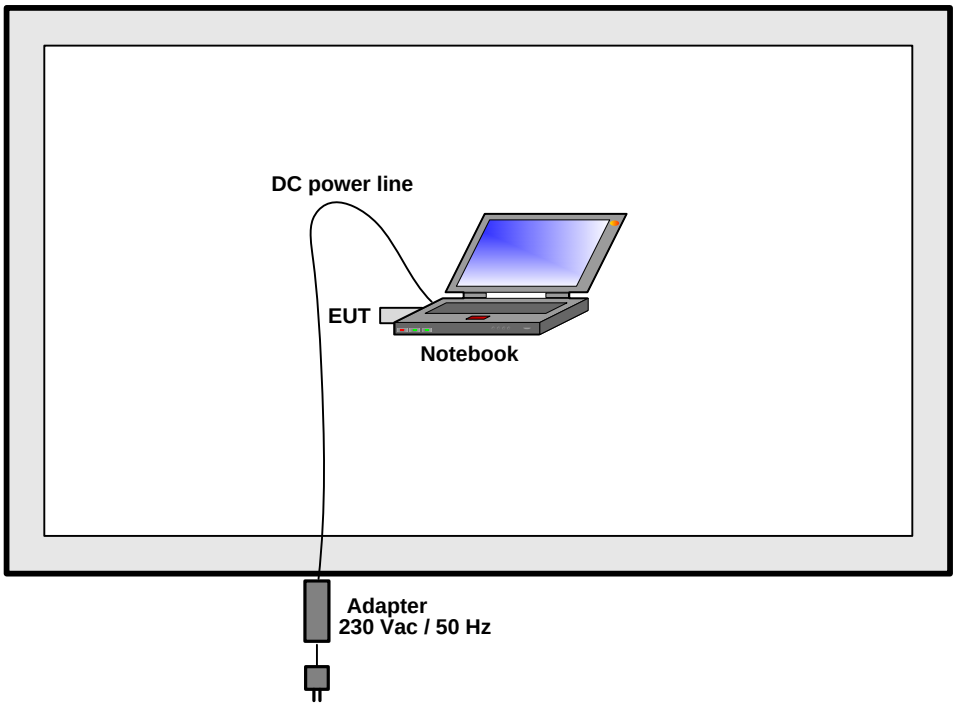
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Power Density, Occupied Channel Bandwidth Transmitter unwanted emissions in the OOB domain
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11b, 11g, HT20, HT40

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Unwanted Emissions in The Spurious Domain, Receiver Spurious Emissions		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
User Position	☐ EUT will be placed in fixed position.		
	☒ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three orthogonal planes.		
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.		
Operating Mode	Operating Mode Description		
1	Transmit / Receive		
Modulation Mode	11b, 11g, HT20, HT40		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT	V		

The Worst Case Mode for Following Conformance Tests	
Tests Item	Adaptivity & Receiver Blocking
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11b, 11g, HT20, HT40

2.4 Test Setup Diagram

Test Setup Diagram - Radiated Test



3 Transmitter Test Result

3.1 RF Output Power

3.1.1 RF Output Power Limit

RF Output Power Limit
Type of Equipment Using Wide Band Modulations Other than FHSS:
☒ mean equivalent isotropic radiated power (e.i.r.p.) ≤ 20 dBm

3.1.2 Measuring Instruments

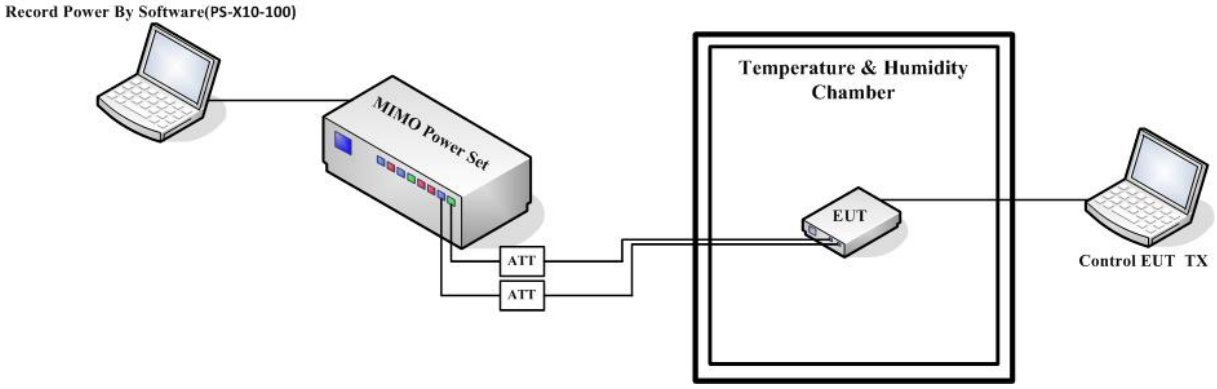
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method	
☒	The measurements shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.
☒	Refer as EN 300 328, clause 5.3.2.2.1.2 for conducted measurement.
Step 1:	Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s. Use the following settings: - Sample speed 1 MS/s or faster. - The samples must represent the power of the signal. - Measurement duration: For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured. NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.
Step 2:	For conducted measurements on devices with multiple transmit chains: - Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports. - Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples. - For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.
Step 3:	Find the start and stop times of each burst in the stored measurement samples. NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB the RMS burst power calculated in step 4.
Step 4:	Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these Pburst values, as well as the start and stop times for each burst.
Step 5:	The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.
Step 6:	Add the (stated) antenna assembly gain "G" in dBi of the individual antenna. If applicable, add the additional beamforming gain "Y" in dB. If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used. The RF Output Power (P) shall be calculated using the formula below: P = A + G + YThis value, which shall comply with the limit given in clauses 4.3.1.2.3 or clauses 4.3.2.2.3, shall be recorded in the test report.
☐	Refer as EN 300 328, clause 5.3.2.2.2 for radiated measurement.

3.1.4 Test Setup

RF Output Power



Test conditions:
The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.

3.1.5 Maximum Antenna Gain

Maximum Antenna Gain Result					
Transmit Chains No.		1	2	-	-
Maximum Gain (dBi)-G		3.79	3.79	-	-
Modulation Mode	**G+Y (dBi)**	**N_{TX}**	**N_{SS} (Min.)**	**STBC**	**Beamforming Gain (dB)-Y**
11b	3.79	1	1	-	-
11g	3.79	1	1	-	-
HT20	3.79	2	1	-	-
HT40	3.79	2	1	-	-

3.1.6 Test Result of RF Output Power

Test Date: Oct. 01, 2015		RF Output Power Result				
Max. Gain (dBi)		3.79		RF Output Power (dBm)		
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	Port 1 (dBm)	EIRP Power (dBm)	EIRP Limit (dBm)
TnomVnom	11b	1	2412	14.62	18.41	20
TminVnom	11b	1	2412	15.69	19.48	20
TmaxVnom	11b	1	2412	13.14	16.93	20
TnomVnom	11b	1	2442	14.63	18.42	20
TminVnom	11b	1	2442	15.73	19.52	20
TmaxVnom	11b	1	2442	12.87	16.66	20
TnomVnom	11b	1	2472	14.26	18.05	20
TminVnom	11b	1	2472	15.47	19.26	20
TmaxVnom	11b	1	2472	12.49	16.28	20
Result				Complied		

Test Date: Oct. 01, 2015		RF Output Power Result				
Max. Gain (dBi)		3.79		RF Output Power (dBm)		
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	Port 1 (dBm)	EIRP Power (dBm)	EIRP Limit (dBm)
TnomVnom	11g	1	2412	14.46	18.25	20
TminVnom	11g	1	2412	15.74	19.53	20
TmaxVnom	11g	1	2412	12.52	16.31	20
TnomVnom	11g	1	2442	14.76	18.55	20
TminVnom	11g	1	2442	15.92	19.71	20
TmaxVnom	11g	1	2442	12.66	16.45	20
TnomVnom	11g	1	2472	14.59	18.38	20
TminVnom	11g	1	2472	15.90	19.69	20
TmaxVnom	11g	1	2472	12.50	16.29	20
Result				Complied		

Test Date: Oct. 01, 2015		RF Output Power Result						
Max. Gain (dBi)		3.79		RF Output Power (dBm)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	Port 1 (dBm)	Port 2 (dBm)	Sum (dBm)	EIRP Power (dBm)	EIRP Limit (dBm)
TnomVnom	HT20	2	2412	12.04	11.78	14.92	18.71	20
TminVnom	HT20	2	2412	12.84	12.69	15.78	19.57	20
TmaxVnom	HT20	2	2412	9.41	9.10	12.27	16.06	20
TnomVnom	HT20	2	2442	11.80	10.84	14.36	18.15	20
TminVnom	HT20	2	2442	13.18	12.25	15.75	19.54	20
TmaxVnom	HT20	2	2442	9.38	8.37	11.92	15.71	20
TnomVnom	HT20	2	2472	11.71	11.66	14.70	18.49	20
TminVnom	HT20	2	2472	13.01	12.93	15.98	19.77	20
TmaxVnom	HT20	2	2472	9.27	9.15	12.22	16.01	20
Result				Complied				

Test Date: Oct. 01, 2015		RF Output Power Result						
Max. Gain (dBi)		3.79		RF Output Power (dBm)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	Port 1 (dBm)	Port 2 (dBm)	Sum (dBm)	EIRP Power (dBm)	EIRP Limit (dBm)
TnomVnom	HT40	2	2422	11.62	11.68	14.66	18.45	20
TminVnom	HT40	2	2422	12.79	12.85	15.83	19.62	20
TmaxVnom	HT40	2	2422	9.34	9.28	12.32	16.11	20
TnomVnom	HT40	2	2442	11.61	11.19	14.41	18.20	20
TminVnom	HT40	2	2442	13.00	12.58	15.80	19.59	20
TmaxVnom	HT40	2	2442	9.44	8.85	12.16	15.95	20
TnomVnom	HT40	2	2462	12.00	12.08	15.05	18.84	20
TminVnom	HT40	2	2462	13.06	13.18	16.13	19.92	20
TmaxVnom	HT40	2	2462	8.99	9.04	12.02	15.81	20
Result				Complied				

3.2 Power Density

3.2.1 Power Density Limit

Power Density Limit
Type of Equipment Using Wide Band Modulations Other than FHSS:
☒ mean equivalent isotropic radiated power (e.i.r.p.) density ≤ 10 dBm/MHz

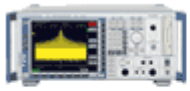
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
☒	Refer as EN 300 328, clause 5.3.3.2.1 for conducted measurement.
Step 1:	Connect the UUT to the spectrum analyzer and use the following settings: - Start & Stop Frequency: 2400 MHz ~ 2483.5MHz - Resolution BW: 10 kHz - Video BW: 30 kHz - Sweep Points: > 8 350 - Detector Mode: RMS - Trace Mode: Max Hold - Sweep time: Auto - Note: For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.
Step 2:	For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.
Step 3:	Add up the values for amplitude (power) for all the samples in the file.
Step 4:	Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2.
Step 5:	Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6:	Shift the start point of the samples added up in step 3 by 1 sample and repeat the procedure in step 3 (i.e. sample #2 to #101).
Step 7:	Repeat step 4 until the end of the data set and record the radiated power density values for each of the 1 MHz segments. From all the recorded results, the highest value is the maximum Power Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.2.2, shall be recorded in the test report.
☐	Refer as EN 300 328, clause 5.3.3.2.2 for radiated measurement.

3.2.4 Test Setup

Power Density
 Spectrum Analyzer — EUT

3.2.5 Test Result of Power Density

Test Date: Oct. 01, 2015			Maximum e.i.r.p. Spectral Density Result			
Modulation Mode	N_{TX}	Freq. (MHz)	PD (dBm/MHz)	Max. Gain (dBi)	EIRP PD (dBm/MHz)	EIRP Limit (dBm/MHz)
11b	1	2412	5.01	3.79	8.80	10
11b	1	2442	5.06	3.79	8.85	10
11b	1	2472	4.61	3.79	8.40	10
11g	1	2412	3.25	3.79	7.04	10
11g	1	2442	3.50	3.79	7.29	10
11g	1	2472	3.25	3.79	7.04	10
HT20	2	2412	3.38	3.79	7.17	10
HT20	2	2442	2.66	3.79	6.45	10
HT20	2	2472	3.16	3.79	6.95	10
HT40	2	2422	-0.19	3.79	3.60	10
HT40	2	2442	-0.14	3.79	3.65	10
HT40	2	2462	0.33	3.79	4.12	10
Result			Complied			

3.3 Occupied Channel Bandwidth

3.3.1 Occupied Channel Bandwidth Limit

Occupied Channel Bandwidth Limit
Type of Frequency Hopping Equipment:
☐ Occupied Channel Bandwidth for each hopping frequency fall completely within 2.4 GHz – 2.4835 GHz.
☐ For non-adaptive equipment with e.i.r.p greater than 10 dBm, Occupied Channel Bandwidth ≤ 5 MHz.
Type of Equipment Using Wide Band Modulations Other than FHSS:
☒ Occupied Channel Bandwidth fall completely within 2.4 GHz – 2.4835 GHz.
☐ For non-adaptive equipment with e.i.r.p greater than 10 dBm, Occupied Channel Bandwidth ≤ 20 MHz.

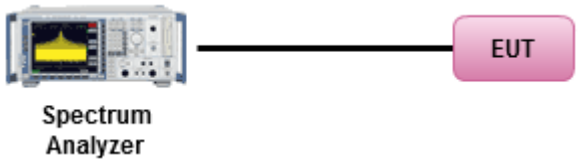
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
☒	Refer as EN 300 328, clause 5.3.8.2.1 for conducted measurement.
	☐ The EUT supports single transmit chain and measurements performed on this transmit chain 2.
	☒ The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☒ Refer as EN 300 328, clause 5.3.8.2.1 for conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
☐	Refer as EN 300 328, clause 5.3.8.2.2clause 5.3.8.2.2 for radiated measurement.

3.3.4 Test Setup

Emission Bandwidth
 Spectrum Analyzer

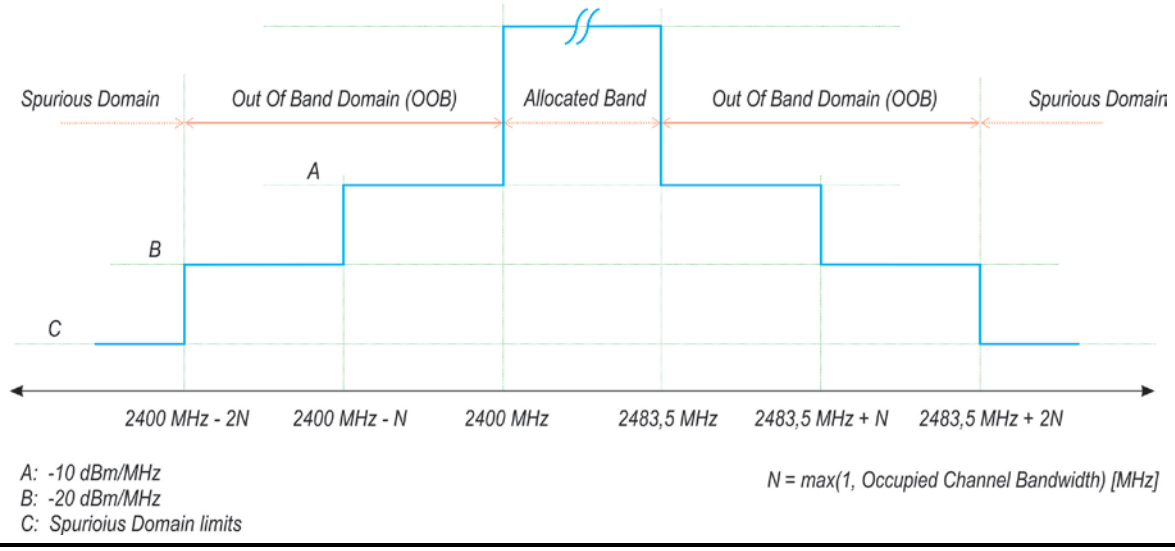
3.3.5 Test Result of Occupied Channel Bandwidth

Test Date: Oct. 01, 2015		Occupied Channel Bandwidth Result			
Modulation Mode	Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	6dB Bandwidth (MHz)
11b	2412	14.47	2404.72400	2419.19600	12.08
11b	2472	14.21	2464.78400	2478.99700	11.08
11g	2412	16.37	2403.82400	2420.19600	16.38
11g	2472	16.35	2463.82400	2480.17600	16.40
HT20	2412	17.46	2403.26400	2420.73000	17.54
HT20	2472	17.41	2463.28400	2480.69600	17.18
HT40	2422	36.03	2403.98400	2440.01600	36.35
HT40	2462	36.00	2443.98400	2479.99100	36.30
Limit		**N/A**	**2400**	**2483.5**	**N/A**
Result		**Complied**			

3.4 Transmitter Unwanted Emissions in the Out-of-band Domain

3.4.1 Transmitter Unwanted Emissions in the Out-of-band Domain Limit

Transmit Mask Limit



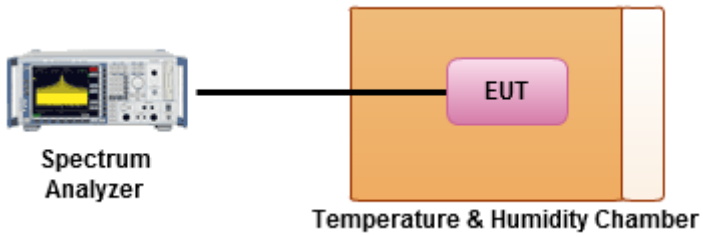
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

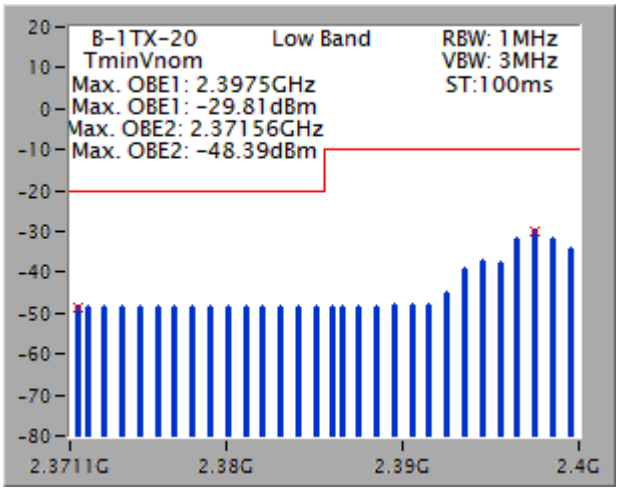
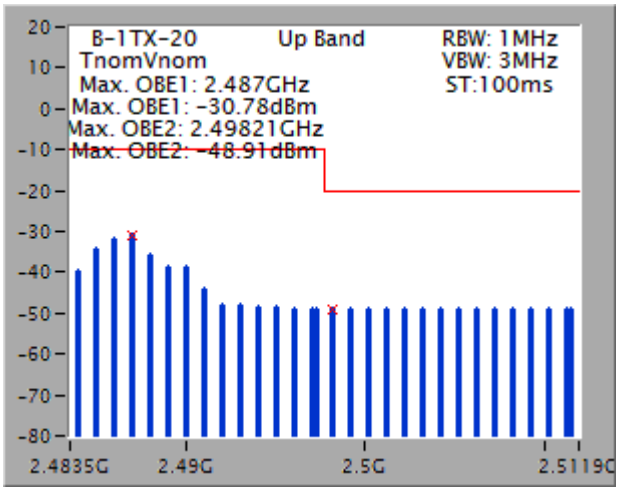
3.4.3 Test Procedures

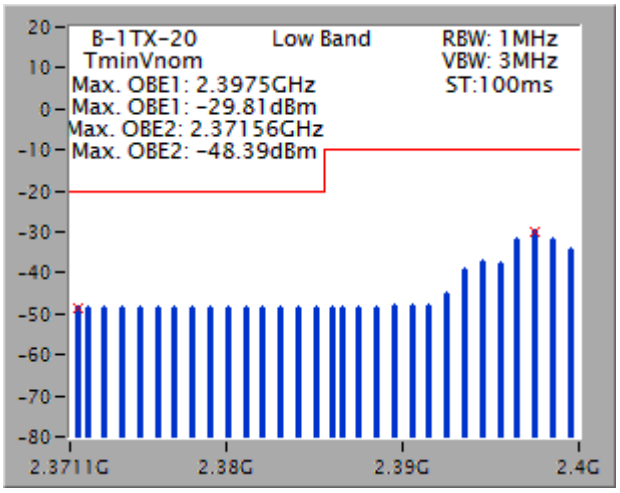
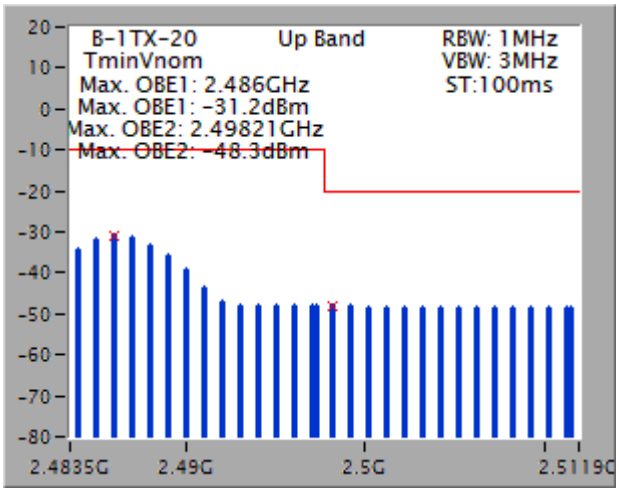
Test Method			
☒	The measurements shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.		
☒	Refer as EN 300 328, clause 5.3.9.2.1 for conducted measurement.		
	☐	The EUT supports single transmit chain and measurements performed on this transmit chain 2.	
	☒	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
	☒	The EUT supports multiple transmit chains using options given below:	
		☒	Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added and compared with the transmit mask limit.
		☐	Option 2: the results for each of the transmit chains shall be individually compared with the transmit mask limit. After that these limits have been reduced with 10 x $\log_{10}$ (A_{ch}). (Number of active transmit chains).
☐	Refer as EN 300 328, clause 5.3.9.2.2 for radiated measurement.		

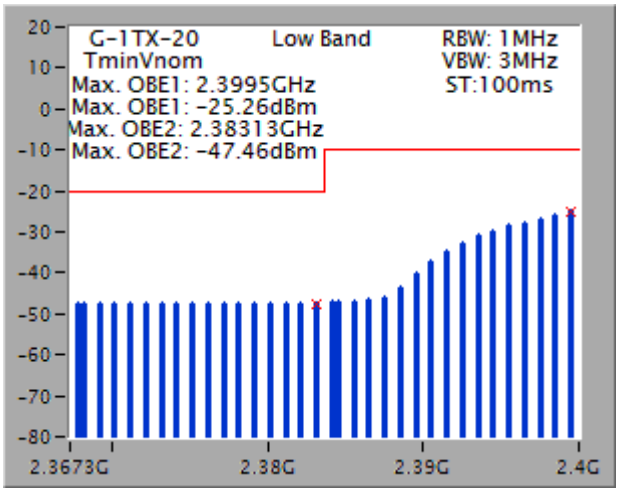
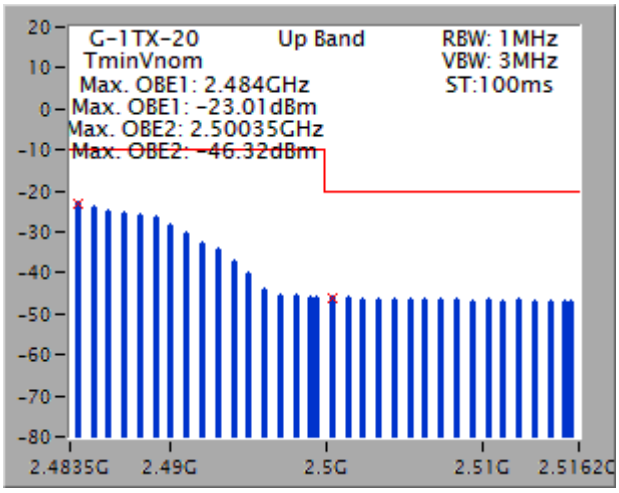
3.4.4 Test Setup

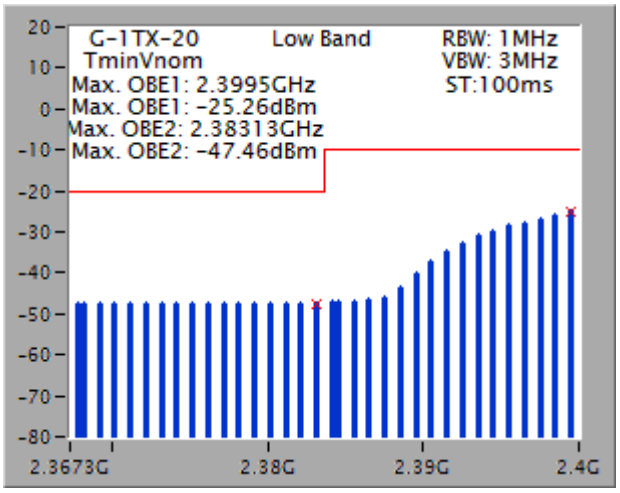
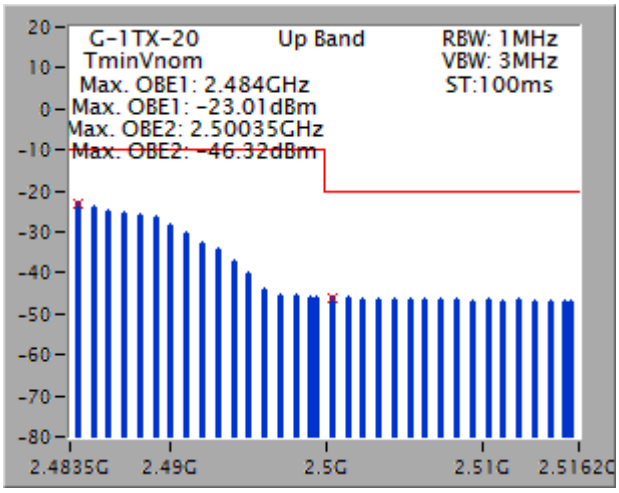
Transmitter Unwanted Emissions in the Out-of-band Domain


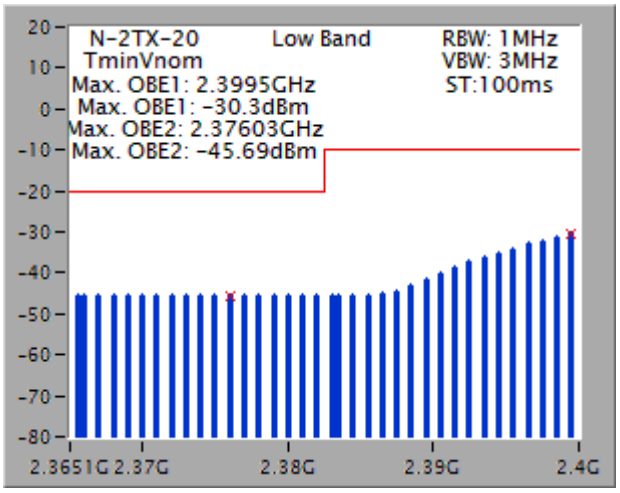
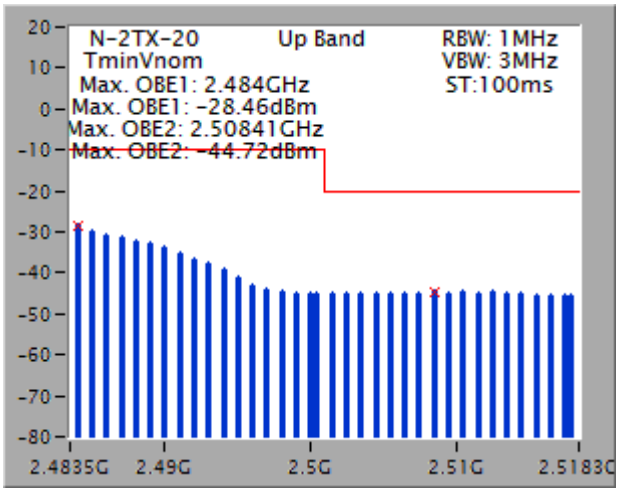
3.4.5 Test Result of Transmitter Unwanted Emissions in the Out-of-band Domain

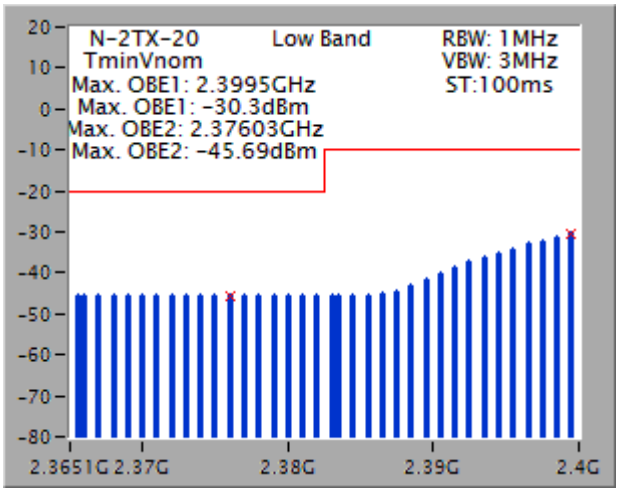
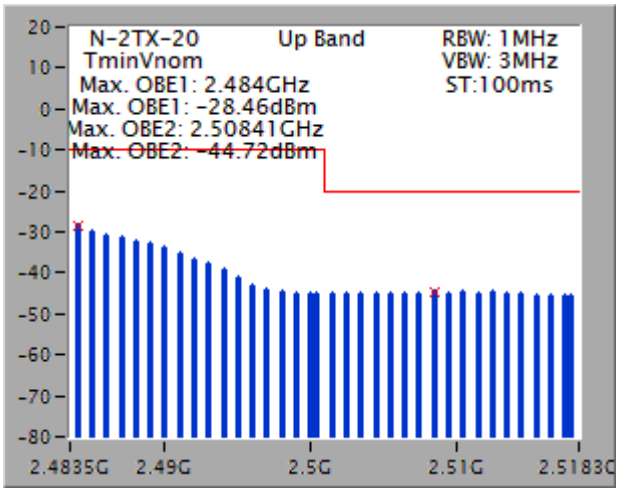
Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	11b	1	2412	2397.5	-34.94	-10
TminVnom	11b	1	2412	2397.5	-29.81	-10
TmaxVnom	11b	1	2412	2397.5	-36.25	-10
TnomVnom	11b	1	2472	2487.0	-30.78	-10
TminVnom	11b	1	2472	2486.0	-31.20	-10
TmaxVnom	11b	1	2472	2486.0	-38.05	-10
Low Band				Up Band		
						
Result				Complied		

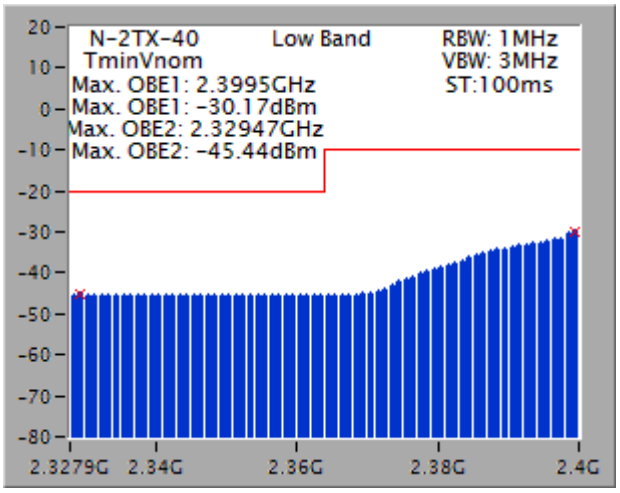
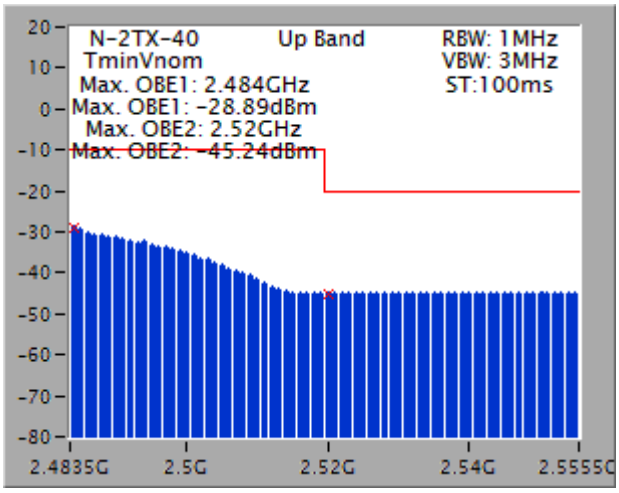
Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	11b	1	2412	2372.03	-49.06	-20
TminVnom	11b	1	2412	2371.56	-48.39	-20
TmaxVnom	11b	1	2412	2373.03	-49.01	-20
TnomVnom	11b	1	2472	2498.21	-48.91	-20
TminVnom	11b	1	2472	2498.21	-48.30	-20
TmaxVnom	11b	1	2472	2498.21	-48.92	-20
Low Band				Up Band		
						
Result				Complied		

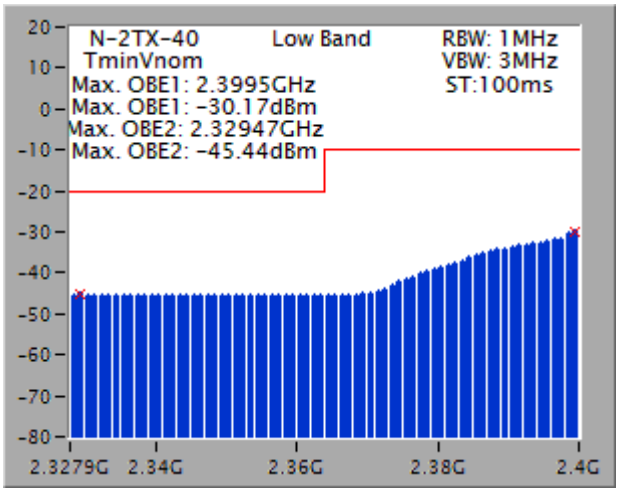
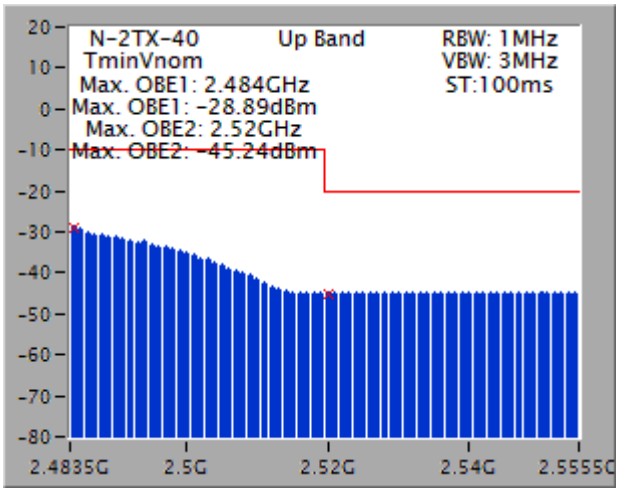
Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	11g	1	2412	2399.5	-27.97	-10
TminVnom	11g	1	2412	2399.5	-25.26	-10
TmaxVnom	11g	1	2412	2399.5	-31.93	-10
TnomVnom	11g	1	2472	2484.0	-24.95	-10
TminVnom	11g	1	2472	2484.0	-23.01	-10
TmaxVnom	11g	1	2472	2484.0	-30.50	-10
Low Band				Up Band		
						
Result				Complied		

Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	11g	1	2412	2376.13	-47.94	-20
TminVnom	11g	1	2412	2383.13	-47.46	-20
TmaxVnom	11g	1	2412	2376.13	-48.57	-20
TnomVnom	11g	1	2472	2508.35	-46.88	-20
TminVnom	11g	1	2472	2500.35	-46.32	-20
TmaxVnom	11g	1	2472	2508.35	-47.64	-20
Low Band				Up Band		
						
Result				Complied		

Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	HT20	2	2412	2399.5	-33.05	-10
TminVnom	HT20	2	2412	2399.5	-30.30	-10
TmaxVnom	HT20	2	2412	2399.5	-36.89	-10
TnomVnom	HT20	2	2472	2484.0	-31.20	-10
TminVnom	HT20	2	2472	2484.0	-28.46	-10
TmaxVnom	HT20	2	2472	2484.0	-35.00	-10
Low Band				Up Band		
						
Result				Complied		

Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	HT20	2	2412	2376.03	-45.95	-20
TminVnom	HT20	2	2412	2376.03	-45.69	-20
TmaxVnom	HT20	2	2412	2370.03	-46.39	-20
TnomVnom	HT20	2	2472	2508.41	-45.03	-20
TminVnom	HT20	2	2472	2508.41	-44.72	-20
TmaxVnom	HT20	2	2472	2508.41	-45.41	-20
Low Band				Up Band		
						
Result				Complied		

Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	HT40	2	2422	2398.5	-33.24	-10
TminVnom	HT40	2	2422	2399.5	-30.17	-10
TmaxVnom	HT40	2	2422	2398.5	-37.02	-10
TnomVnom	HT40	2	2462	2484.0	-31.68	-10
TminVnom	HT40	2	2462	2484.0	-28.89	-10
TmaxVnom	HT40	2	2462	2484.0	-35.75	-10
Low Band				Up Band		
						
Result				Complied		

Transmitter Unwanted Emissions in the Out-of-band Domain Result						
Test Date: Oct. 01, 2015		OOB Emissions (dBm/MHz)				
Condition	Modulation Mode	N_{TX}	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions	Limit
TnomVnom	HT40	2	2422	2328.44	-45.76	-20
TminVnom	HT40	2	2422	2329.47	-45.44	-20
TmaxVnom	HT40	2	2422	2335.47	-46.20	-20
TnomVnom	HT40	2	2462	2520.00	-45.69	-20
TminVnom	HT40	2	2462	2520.00	-45.24	-20
TmaxVnom	HT40	2	2462	2520.00	-46.24	-20
Low Band				Up Band		
						
Result				Complied		

3.5 Transmitter Unwanted Emissions in the Spurious Domain

3.5.1 Transmitter Unwanted Emissions in the Spurious Domain Limit

Frequency Range	Maximum Power e.r.p. (≤1 GHz) ; e.r.p. (>1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz
Note 1: spurious domain ≤ (2400 MHz – 2N) and spurious domain ≥ (2483.5 MHz + 2N); N = MAX (1, Occupied Channel Bandwidth) MHz		

3.5.2 Measuring Instruments

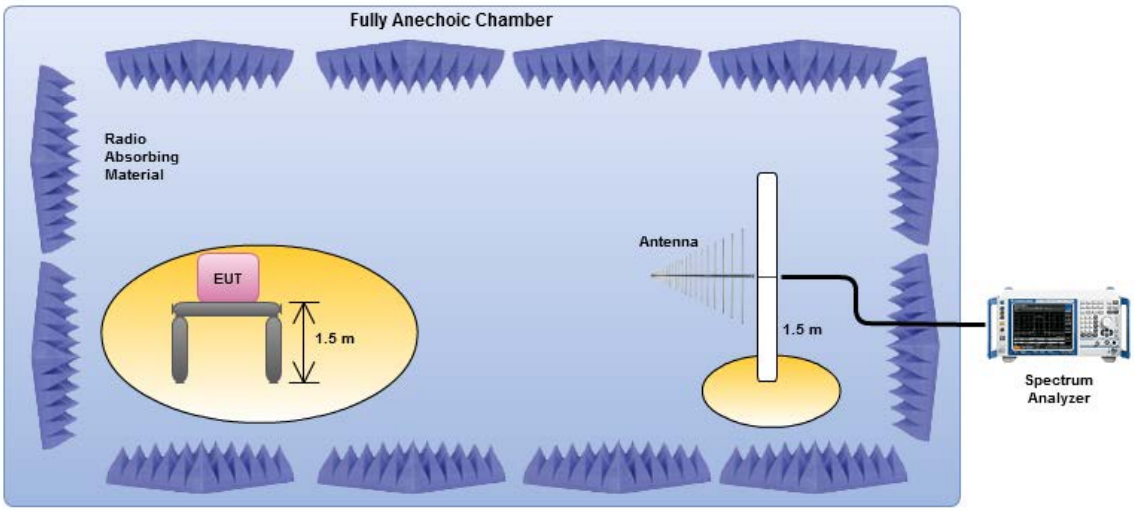
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method			
☐	Refer as EN 300 328, clause 5.3.10.2.1 for conducted measurement. Conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).		
	☐	The EUT supports single transmit chain and measurements performed on this transmit chain.	
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
	☐	The EUT supports multiple transmit chains using options given below:	
		☐	Option 1: The trace data for each transmit chain has to be individually recorded and each transmit chain trace data shall be added and compared with the transmitter spurious emissions limit.
		☐	Option 2: the results for each of the transmit chains shall be individually compared with the transmitter spurious emissions limit. After that these limits have been reduced with 10 x $\log_{10}$ (A_{ch}). (Number of active transmit chains).
	☐	Equipment with single transmit chain. All measurement had be performed on this transmit chain.	
☒	Refer as EN 300 328, clause 5.3.10.2.2 for radiated measurement.		

3.5.4 Test Setup

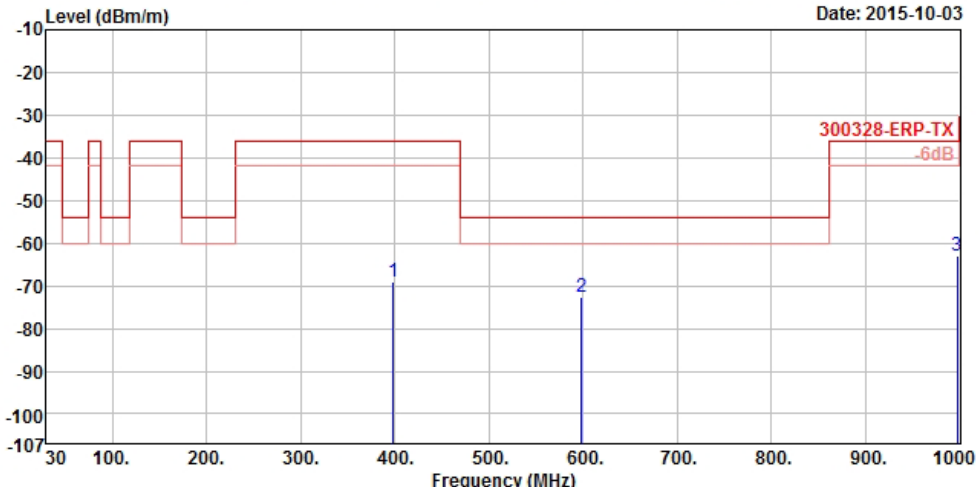
Transmitter Unwanted Emissions in the Spurious Domain



A measuring distance of at least 3 m shall be used for measurements at frequencies up to 1 GHz. For frequencies above 1 GHz, any suitable measuring far field distance may be used, depending on the test system noise floor for detecting spurious emission signals. The equipment size (excluding the antenna) shall be less than 20 % of the measuring distance. The height of the equipment or of the substitution antenna shall be 1.5 m.

3.5.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

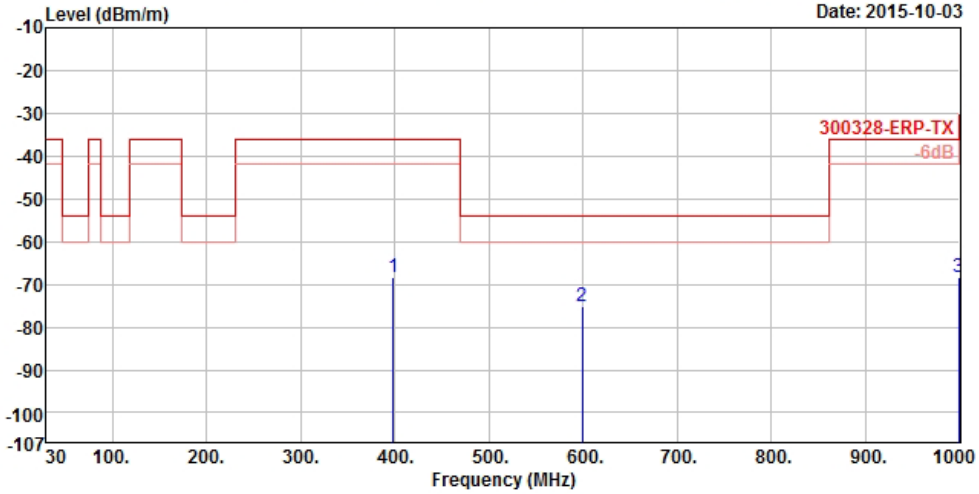
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	HT20	**Polarization**	V
Operating Mode	1	**Operating Function**	Transmit



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	398.600	-68.92	-32.92	-36.00	-71.98	3.06
2	598.420	-72.62	-18.62	-54.00	-76.60	3.98
3	997.090	-62.83	-26.83	-36.00	-71.86	9.03

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	HT20	**Polarization**	H
Operating Mode	1	**Operating Function**	Transmit

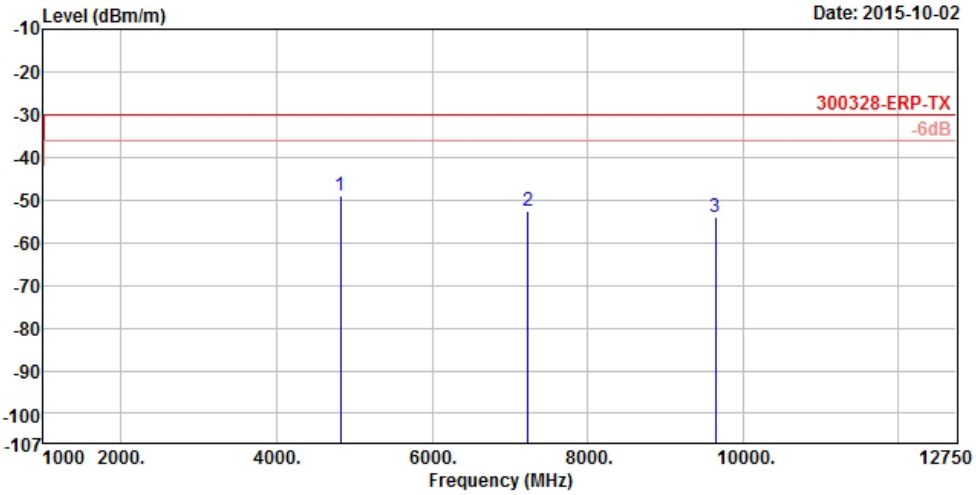


	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	398.600	-68.34	-32.34	-36.00	-71.93	3.59
2	599.390	-75.00	-21.00	-54.00	-78.69	3.69
3	999.030	-68.22	-32.22	-36.00	-77.63	9.41

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)

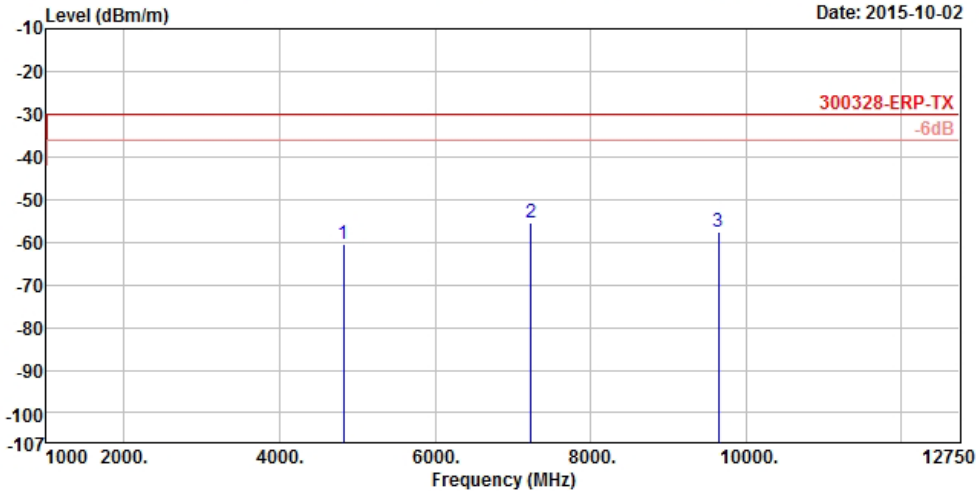
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11b	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-48.97	-18.97	-30.00	-42.53	-6.44
2	7236.000	-52.56	-22.56	-30.00	-52.49	-0.07
3	9648.000	-54.06	-24.06	-30.00	-53.98	-0.08

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

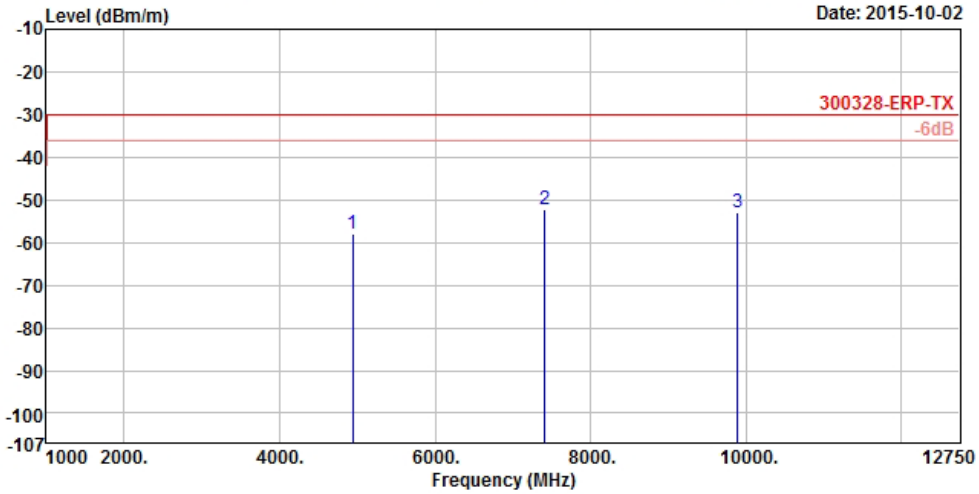
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11b	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-60.30	-30.30	-30.00	-53.08	-7.22
2	7236.000	-55.48	-25.48	-30.00	-53.04	-2.44
3	9648.000	-57.44	-27.44	-30.00	-53.42	-4.02

Note 1: ">6dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

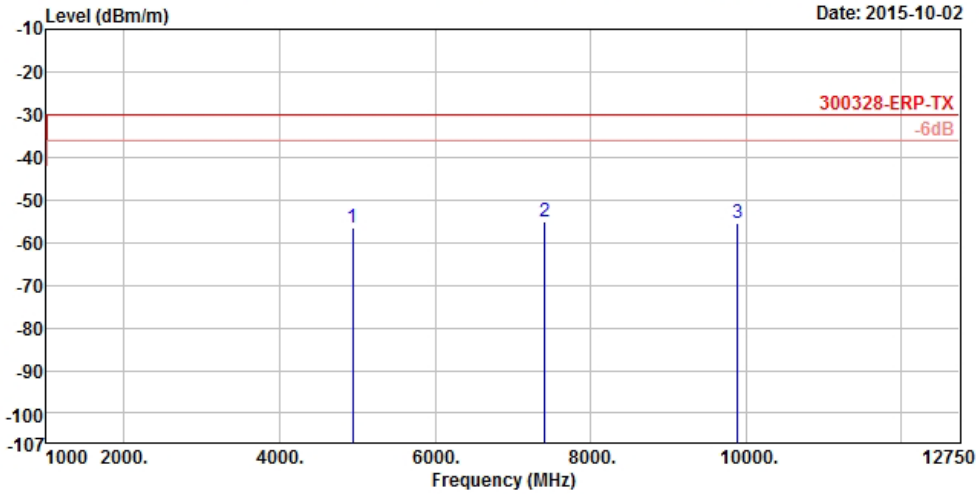
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11b	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-57.99	-27.99	-30.00	-51.77	-6.22
2	7416.000	-52.25	-22.25	-30.00	-51.58	-0.67
3	9888.000	-52.79	-22.79	-30.00	-53.03	0.24

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

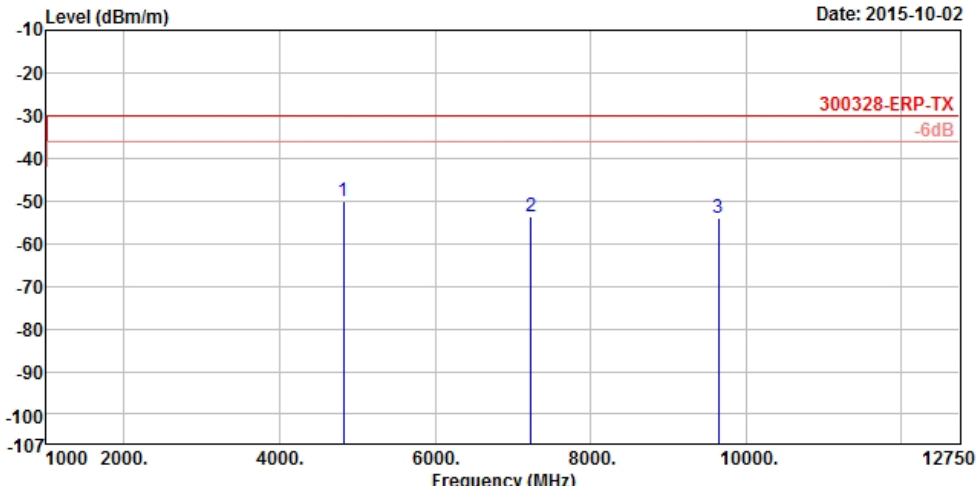
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11b	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-56.42	-26.42	-30.00	-49.33	-7.09
2	7416.000	-55.08	-25.08	-30.00	-52.72	-2.36
3	9888.000	-55.55	-25.55	-30.00	-52.93	-2.62

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

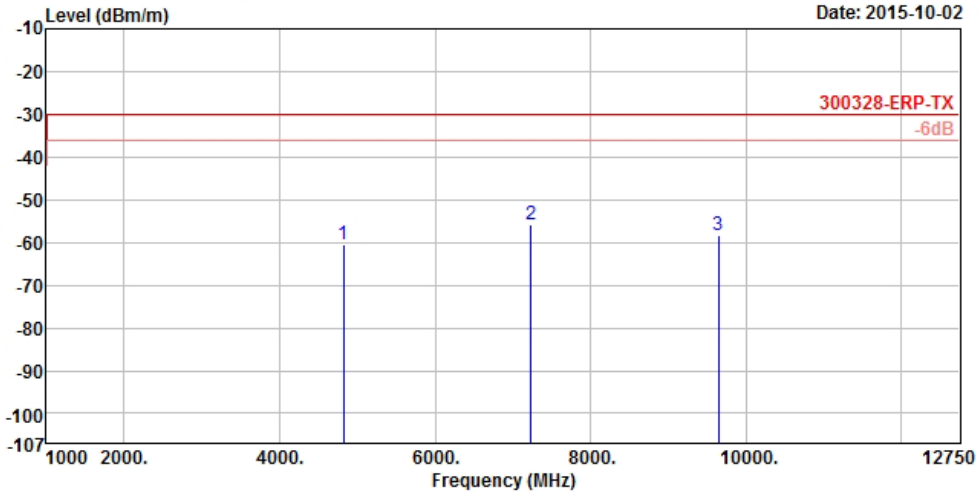
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11g	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-50.26	-20.26	-30.00	-43.82	-6.44
2	7236.000	-53.83	-23.83	-30.00	-53.76	-0.07
3	9648.000	-53.94	-23.94	-30.00	-53.86	-0.08

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

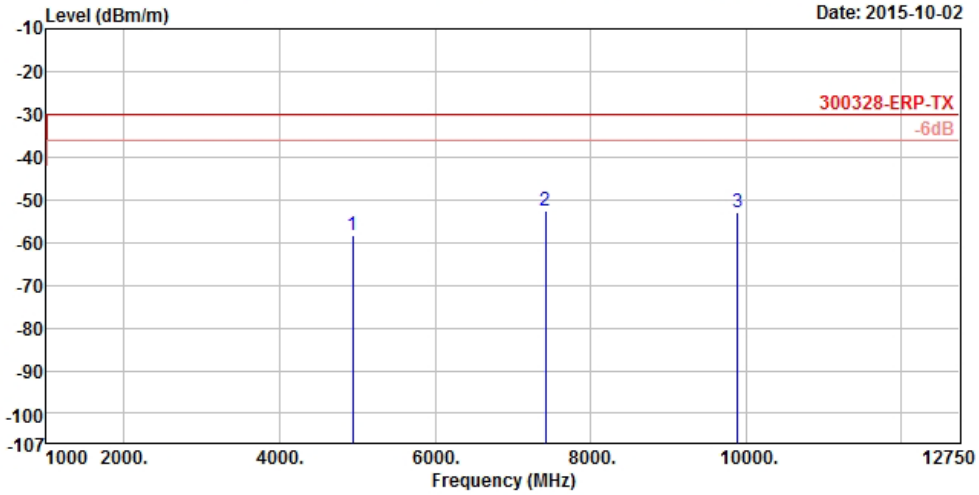
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11g	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-60.64	-30.64	-30.00	-53.42	-7.22
2	7236.000	-55.84	-25.84	-30.00	-53.40	-2.44
3	9648.000	-58.40	-28.40	-30.00	-54.38	-4.02

Note 1: ">6dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

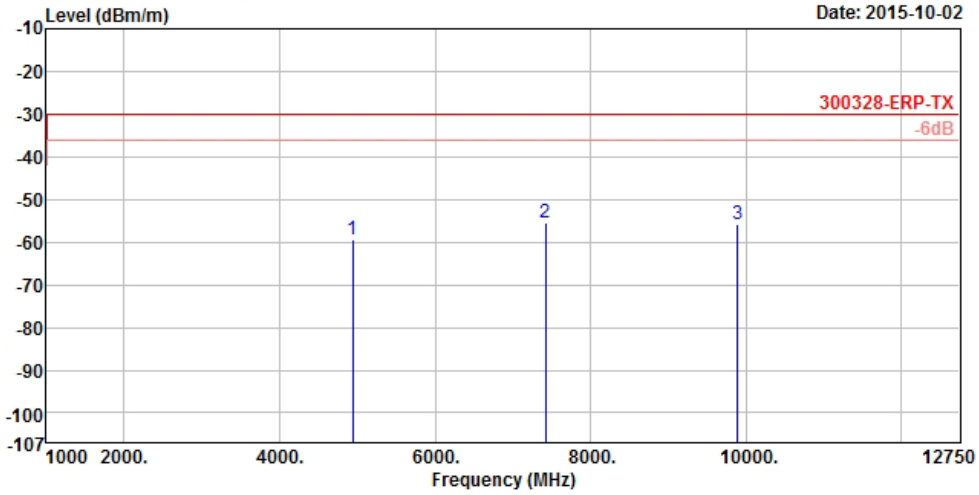
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11g	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-58.41	-28.41	-30.00	-52.19	-6.22
2	7416.750	-52.76	-22.76	-30.00	-52.09	-0.67
3	9888.000	-52.79	-22.79	-30.00	-53.03	0.24

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

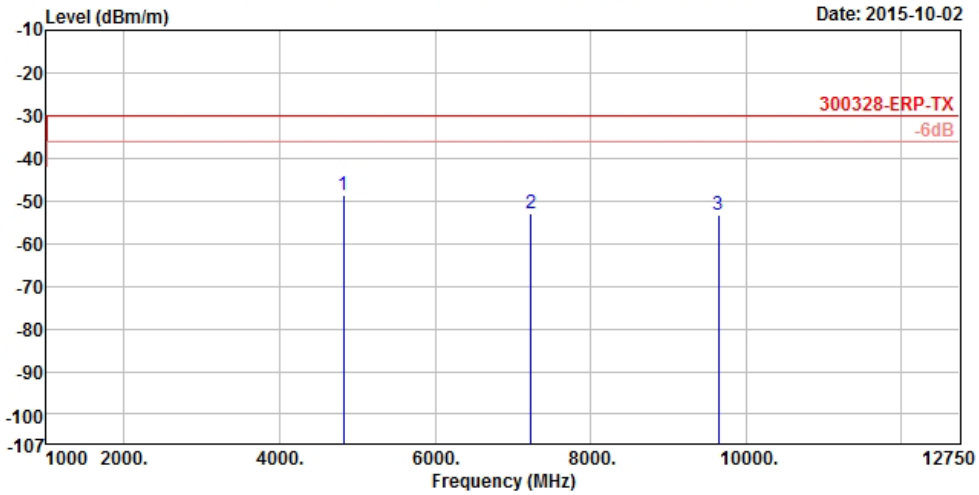
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	11g	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-59.46	-29.46	-30.00	-52.37	-7.09
2	7416.750	-55.41	-25.41	-30.00	-53.05	-2.36
3	9888.000	-55.82	-25.82	-30.00	-53.20	-2.62

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

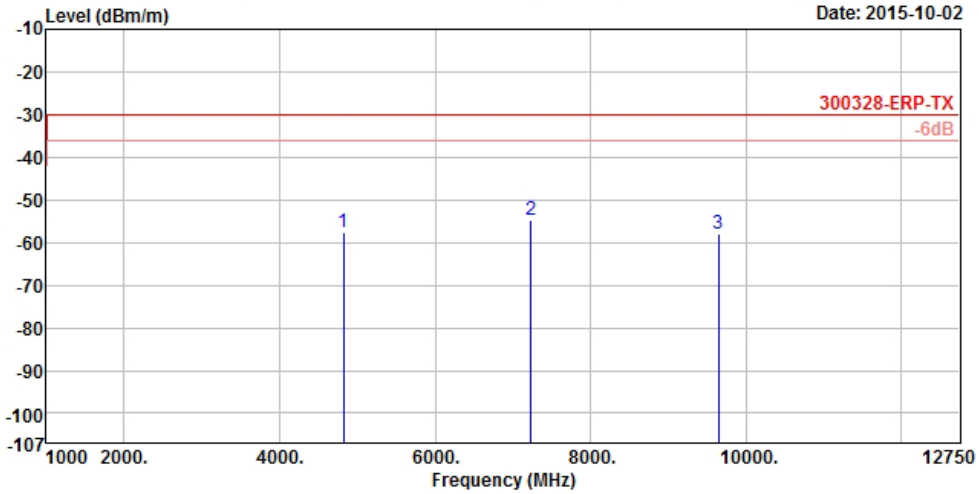
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT20	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-48.75	-18.75	-30.00	-42.31	-6.44
2	7236.000	-52.84	-22.84	-30.00	-52.77	-0.07
3	9648.000	-53.35	-23.35	-30.00	-53.27	-0.08

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

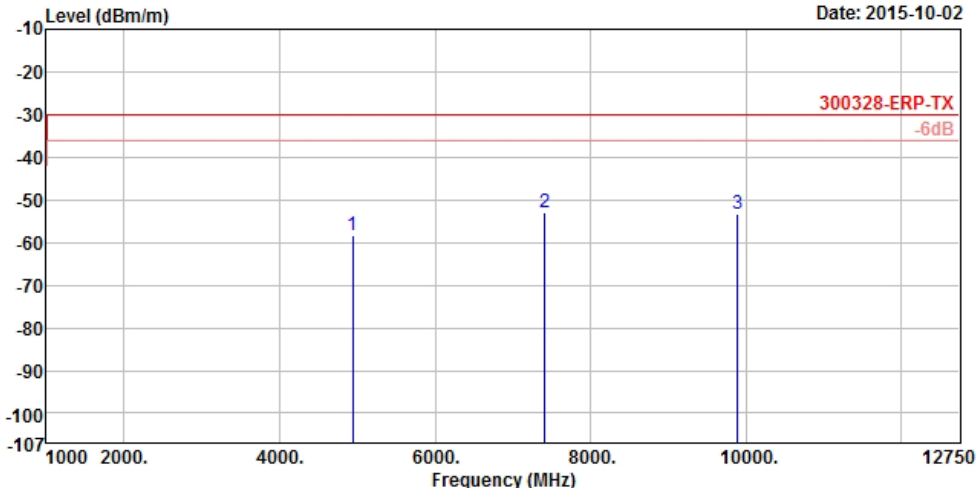
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT20	**Test Freq. (MHz)**	2412
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4824.000	-57.44	-27.44	-30.00	-50.22	-7.22
2	7236.000	-54.87	-24.87	-30.00	-52.43	-2.44
3	9648.000	-57.80	-27.80	-30.00	-53.78	-4.02

Note 1: ">6dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

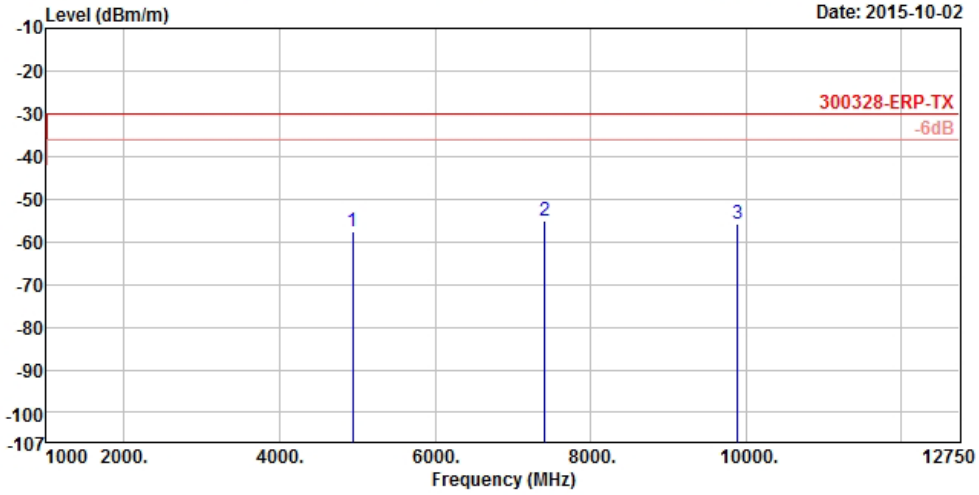
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT20	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-58.26	-28.26	-30.00	-52.04	-6.22
2	7416.000	-53.08	-23.08	-30.00	-52.41	-0.67
3	9888.000	-53.26	-23.26	-30.00	-53.50	0.24

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

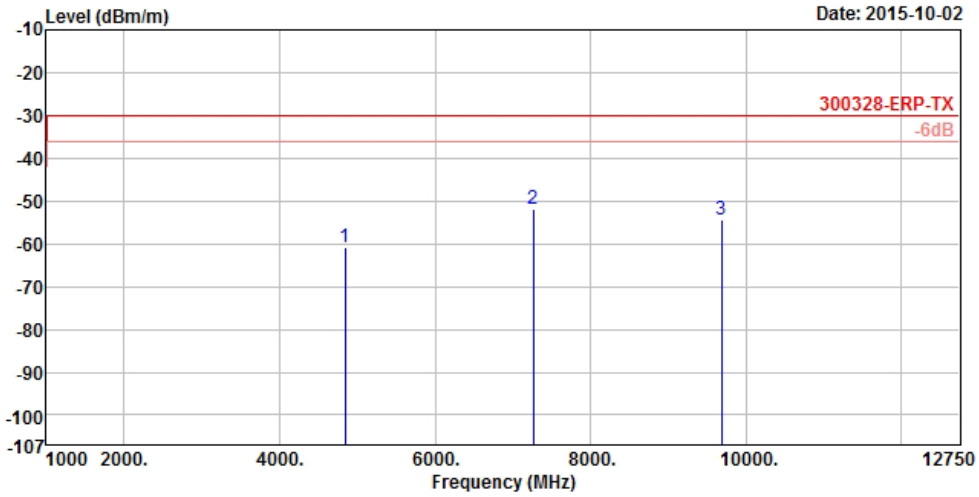
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT20	**Test Freq. (MHz)**	2472
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4944.000	-57.60	-27.60	-30.00	-50.51	-7.09
2	7416.000	-55.25	-25.25	-30.00	-52.89	-2.36
3	9888.000	-55.85	-25.85	-30.00	-53.23	-2.62

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

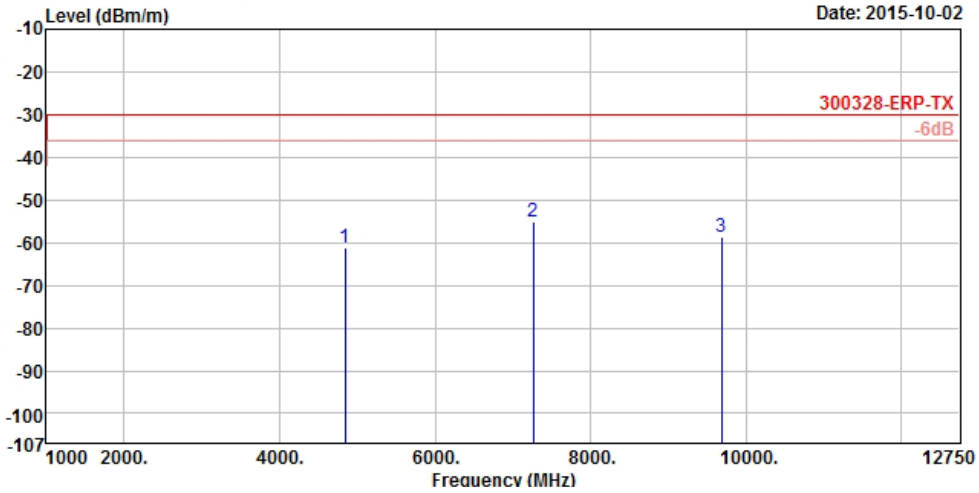
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT40	**Test Freq. (MHz)**	2422
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4844.000	-60.71	-30.71	-30.00	-54.30	-6.41
2	7266.000	-51.94	-21.94	-30.00	-51.75	-0.19
3	9688.000	-54.54	-24.54	-30.00	-54.51	-0.03

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

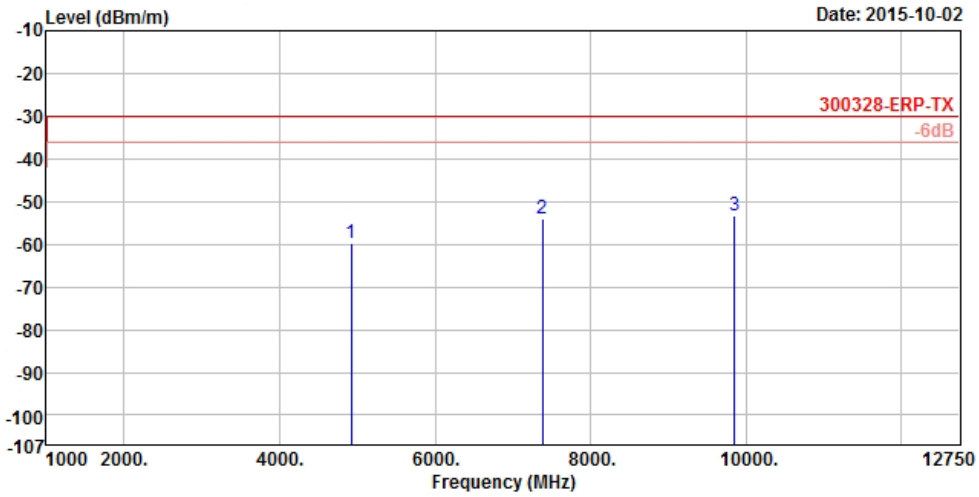
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT40	**Test Freq. (MHz)**	2422
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4844.000	-61.01	-31.01	-30.00	-53.80	-7.21
2	7266.000	-55.13	-25.13	-30.00	-52.70	-2.43
3	9688.000	-58.57	-28.57	-30.00	-54.75	-3.82

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

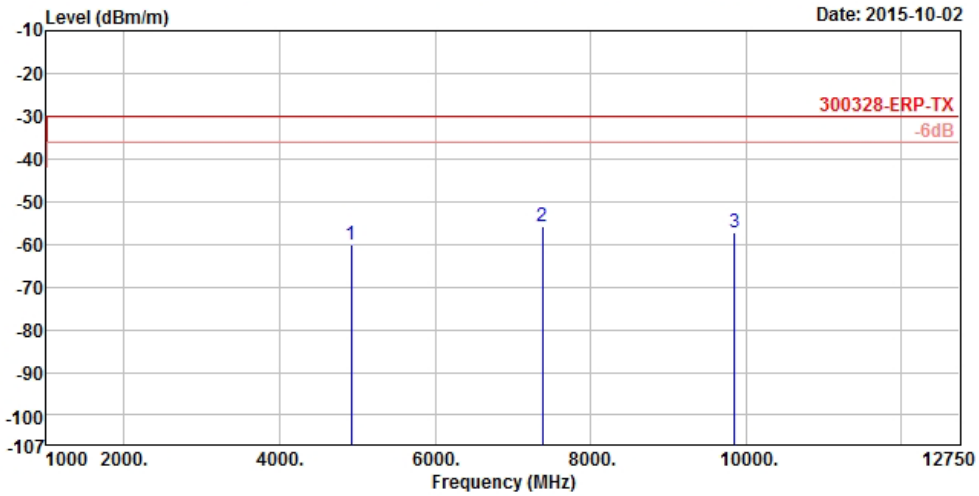
Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT40	**Test Freq. (MHz)**	2462
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4924.000	-59.86	-29.86	-30.00	-53.61	-6.25
2	7386.000	-53.87	-23.87	-30.00	-53.27	-0.60
3	9848.000	-53.25	-23.25	-30.00	-53.42	0.17

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Transmitter Radiated Spurious Emissions (Above 1GHz)			
Modulation Mode	HT40	**Test Freq. (MHz)**	2462
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	4924.000	-60.15	-30.15	-30.00	-53.04	-7.11
2	7386.000	-55.92	-25.92	-30.00	-53.56	-2.36
3	9848.000	-57.26	-27.26	-30.00	-54.34	-2.92

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

4 Receiver Test Result

4.1 Receiver Spurious Emissions

4.1.1 Receiver Spurious Emissions Limit

Frequency Range	Maximum Power e.r.p. (≤1 GHz) ; e.r.p. (>1 GHz)	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

4.1.2 Measuring Instruments

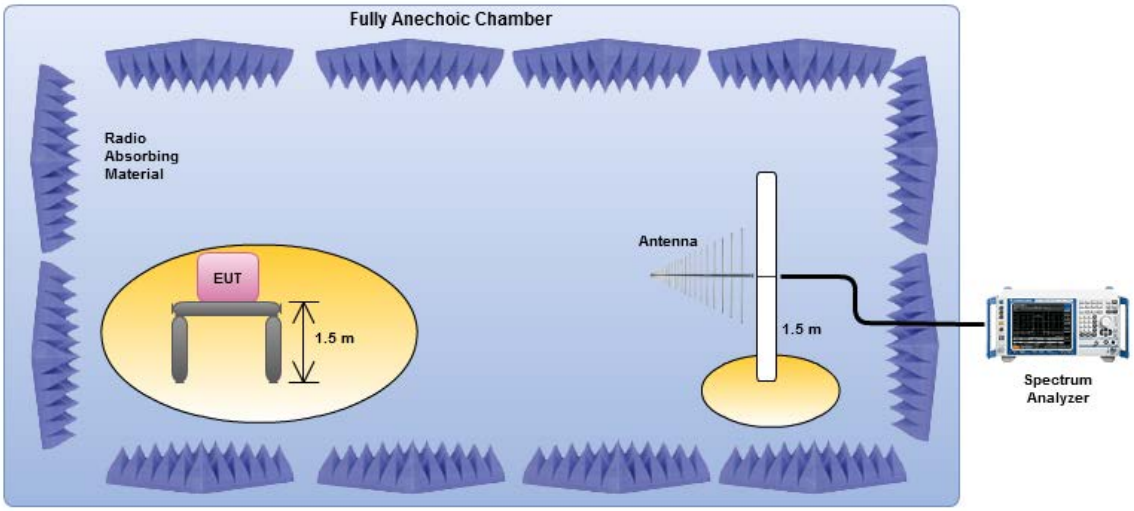
Refer a test equipment and calibration data table in this test report.

4.1.3 Test Procedures

Test Method			
☐	Refer as EN 300 328, clause 5.3.11.2.1 for conducted measurement. Conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).		
	☐	The EUT supports single receive chain and measurements performed on this receive chain.	
	☐	The EUT supports diversity receiving and the results on receive chain port 1 is the worst case.	
	☐	The EUT supports multiple receive chains using options given below:	
		☐	Option 1: The trace data for each receive chain has to be individually recorded and each receive chain trace data shall be added and compared with the receiver spurious emissions limit.
		☐	Option 2: the results for each of the receive chains shall be individually compared with the receiver spurious emissions limit. After that these limits have been reduced with 10 x $\log_{10}$ (A_{ch}). (Number of active receive chains).
☒	Refer as EN 300 328, clause 5.3.11.2.2 for radiated measurement.		

4.1.4 Test Setup

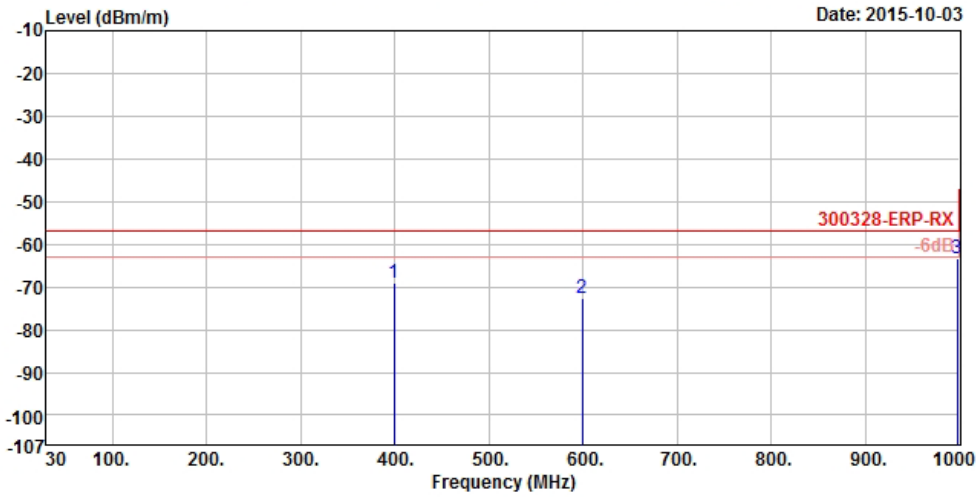
Receiver Spurious Emissions



A measuring distance of at least 3 m shall be used for measurements at frequencies up to 1 GHz. For frequencies above 1 GHz, any suitable measuring far field distance may be used, depending on the test system noise floor for detecting spurious emission signals. The equipment size (excluding the antenna) shall be less than 20 % of the measuring distance. The height of the equipment or of the substitution antenna shall be 1.5 m.

4.1.5 Receiver Radiated Spurious Emissions (Below 1GHz)

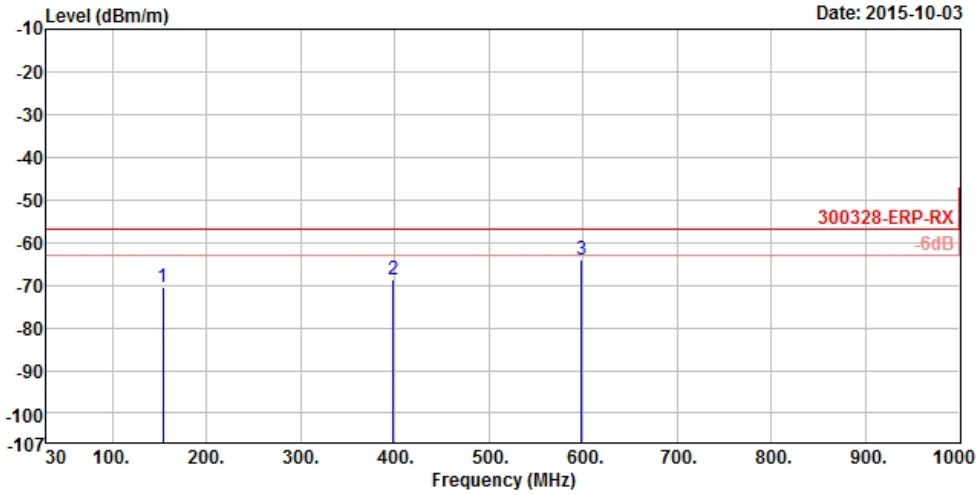
Receiver Radiated Spurious Emissions (Below 1GHz)			
Operating Function	Receive	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	399.570	-69.13	-12.13	-57.00	-72.24	3.11
2	599.390	-72.46	-15.46	-57.00	-76.46	4.00
3	997.090	-63.40	-6.40	-57.00	-72.43	9.03

Note 1: ">6dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Receiver Radiated Spurious Emissions (Below 1GHz)			
Operating Function	Receive	**Polarization**	H

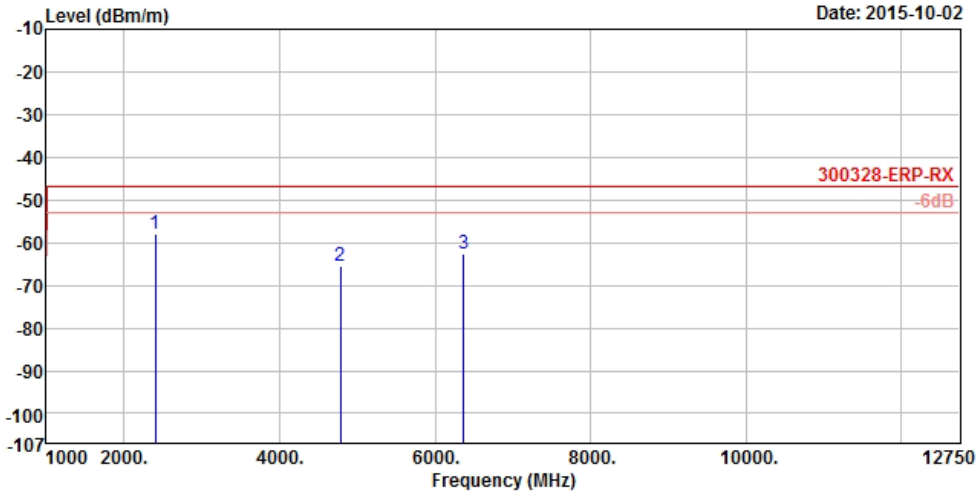


	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	154.160	-70.39	-13.39	-57.00	-65.76	-4.63
2	398.600	-68.82	-11.82	-57.00	-72.41	3.59
3	598.420	-63.97	-6.97	-57.00	-67.65	3.68

Note 1: ">6dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

4.1.6 Receiver Radiated Spurious Emissions (Above 1GHz)

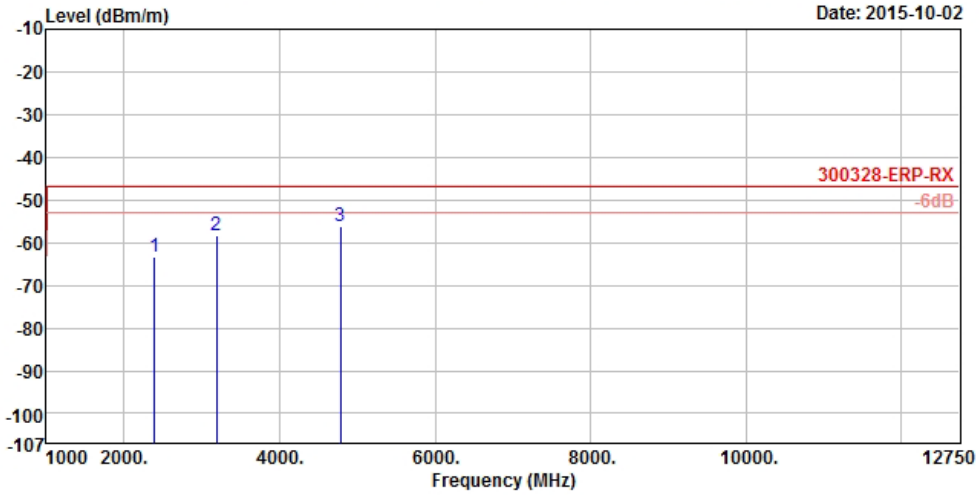
Receiver Radiated Spurious Emissions (Above 1GHz)			
Operating Function	Receive	**Test Freq. (MHz)**	2412
Polarization	V		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	2398.250	-57.86	-10.86	-47.00	-45.81	-12.05
2	4783.500	-65.37	-18.37	-47.00	-58.86	-6.51
3	6369.750	-62.45	-15.45	-47.00	-59.69	-2.76

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

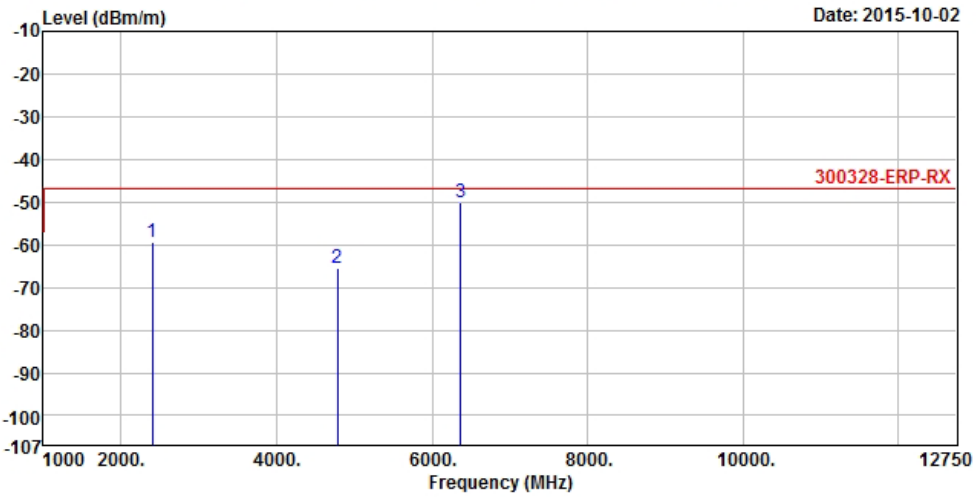
Receiver Radiated Spurious Emissions (Above 1GHz)			
Operating Function	Receive	**Test Freq. (MHz)**	2412
Polarization	H		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	2386.500	-63.39	-16.39	-47.00	-51.83	-11.56
2	3185.500	-58.45	-11.45	-47.00	-47.52	-10.93
3	4783.500	-56.13	-9.13	-47.00	-48.86	-7.27

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

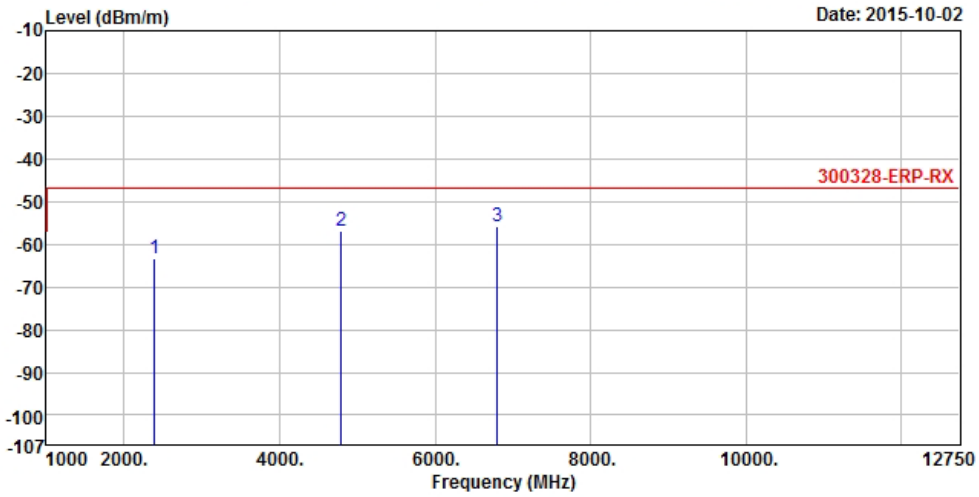
Receiver Radiated Spurious Emissions (Above 1GHz)			
Operating Function	Receive	**Test Freq. (MHz)**	2472
Polarization	V		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	2398.250	-59.38	-12.38	-47.00	-47.33	-12.05
2	4783.500	-65.34	-18.34	-47.00	-58.83	-6.51
3	6369.750	-50.11	-3.11	-47.00	-47.35	-2.76

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Receiver Radiated Spurious Emissions (Above 1GHz)			
Operating Function	Receive	**Test Freq. (MHz)**	2472
Polarization	H		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm/m	dB	dBm/m	dBm	dB/m
1	2386.500	-63.24	-16.24	-47.00	-51.68	-11.56
2	4795.250	-57.05	-10.05	-47.00	-49.78	-7.27
3	6804.500	-55.97	-8.97	-47.00	-52.42	-3.55

Note 1: “>6dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

5 Adaptivity Test Result

5.1 Adaptivity and Receiver Blocking

5.1.1 Adaptivity and Receiver Blocking Limit

Adaptivity and Receiver Blocking Limit
Type of Equipment Using Wide Band Modulations Other than FHSS:
☒ Only for adaptive systems and RF Output Power > 10 dBm
☐ Non-LBT based Detect and Avoid: ◆ minimum remain unavailable = 1sec; ◆ minimum Idle Period time = 100us; ◆ maximum Channel Occupancy Time (COT) = 40ms ◆ i.e. COT [40ms] + Idle Period [2ms - 5% of COT]; N x [COT+Idle]; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☐ LBT based Detect and Avoid (Frame Based Equipment): ◆ minimum Clear Channel Assessment (CCA) time = 18 us; ◆ CCA declared by the supplier ◆ COT = 1 ms to 10 ms ◆ Idle Period = 5% of COT ◆ e.g. CCA [120us] + COT [10ms] + Idle Period [0.5ms - 5% of COT]; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☒ LBT based Detect and Avoid (Load Based Equipment with spectrum sharing mechanism IEEE Std.): ◆ LBT based spectrum sharing mechanism may implement IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16,clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8 providing they comply with the conformance requirements referred to in clause 4.3.2.6.3.4.
☒ LBT based Detect and Avoid (Load Based Equipment): ◆ minimum Clear Channel Assessment (CCA) time = 18 us; ◆ COT ≤ 13ms; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☒ Short Control Signalling Transmissions: ◆ Short Control Signalling Transmissions shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

Receiver Blocking Parameters				
Equipment Type	**Wanted Signal Mean Power from Companion Device**	**Blocking Signal Frequency (MHz)**	**Blocking Signal Mean power (dBm)**	**Type of Interfering Signal**
LBT	sufficient to maintain the link (see note 2)	2395 or 2488,5 (see note 1)	-35	CW
Non-LBT	-30 dBm			
Note 1: The highest blocking frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest blocking frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.3.7.1. Note 2: A typical value which can be used in most cases is -50 dBm/MHz.				

5.1.2 Measuring Instruments

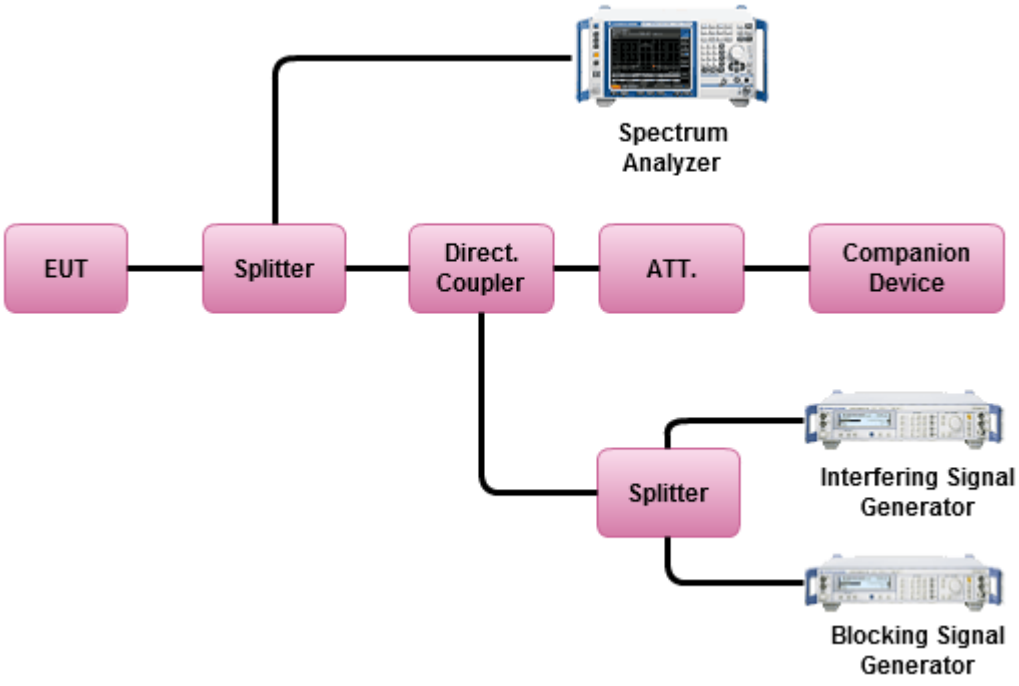
Refer a test equipment and calibration data table in this test report.

5.1.3 Test Procedures

Test Method	
☒	Configure the EUT for normal transmissions with a sufficiently high payload to allow demonstration the adaptive mechanism.
☒	Refer as EN 300 328, clause 5.3.7.2.1 for conducted measurement.
☒	The EUT supports single receive chain and measurements performed on this receive chain.
☒	For conducted measurements on devices with multiple transmit chains and receive chains. The power splitter/combiner shall be used to combine all the transmit/receive chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.
☐	Refer as EN 300 328, clause 5.3.7.2.2 for radiated measurement.

5.1.4 Test Setup

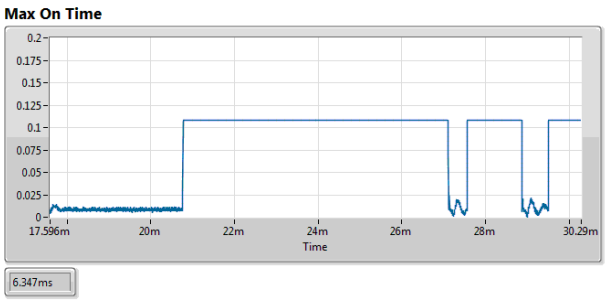
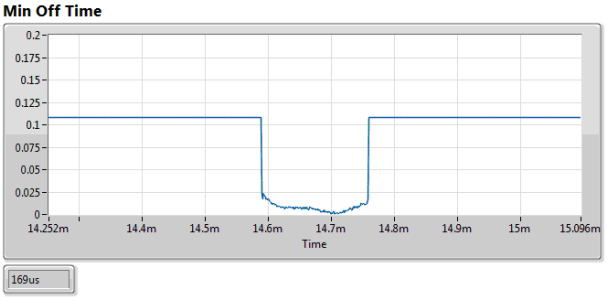
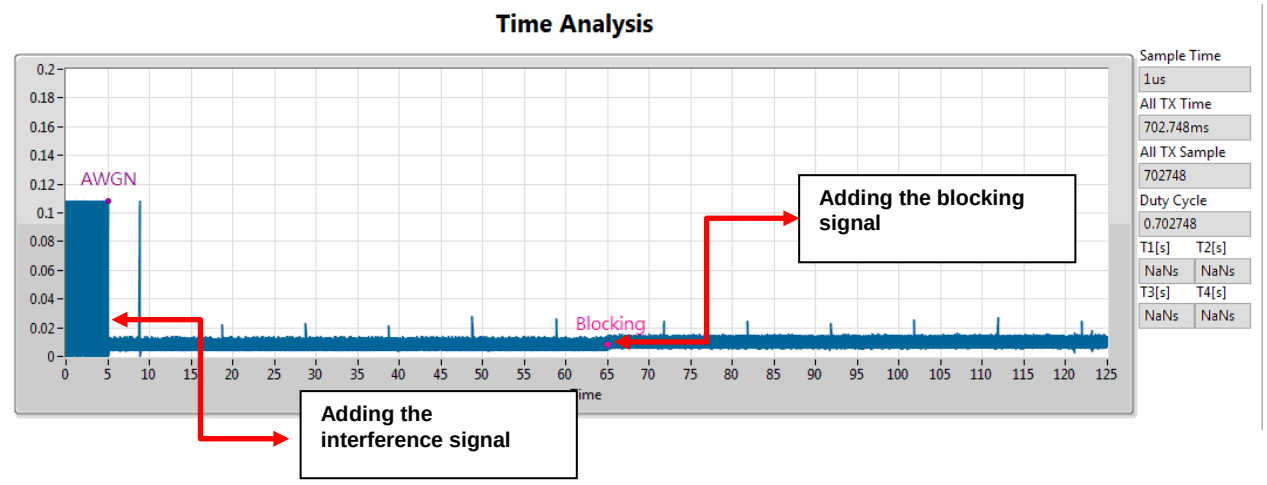
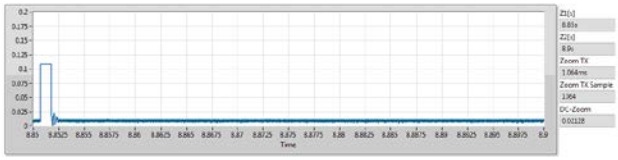
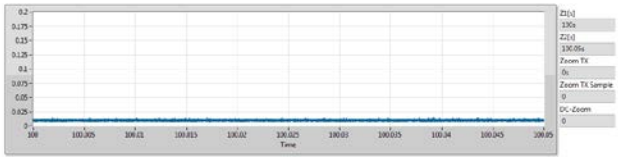
Adaptivity and Receiver Blocking – Conducted Method



5.1.5 Test Result of Adaptivity and Receiver Blocking

Adaptivity & Receiver Blocking Result.							
Detection Threshold Level (dBm)		(-70 dBm/MHz + 20 - Pout e.i.r.p.)= -70 + 20 - 19.92 + 3.79 = -66.13 dBm					
Modulation Mode	Freq. (MHz)	Channel Occupancy Time (ms)	Idle Period Time (ms)	Short Control Signalling Transmissions (ms)			
				Adaptivity		Adaptivity & Receiver Blocking	
				Bin	Time (ms)	Bin	Time (ms)
11b	2412	6.347	0.169	1064	1.064	0	0
11b	2472	12.499	0.388	1314	1.314	0	0
11g	2412	3.606	0.061	262	0.262	0	0
11g	2472	9.542	0.076	60	0.060	0	0
HT20	2412	4.789	0.053	0	0	0	0
HT20	2472	9.542	0.066	40	0.040	0	0
HT40	2422	1.759	0.043	307	0.307	22	0.022
HT40	2462	3.470	0.042	1590	1.590	498	0.498
Limit		13ms	0.018ms	5 ms in 50 ms period		5 ms in 50 ms period	
Result		Complied					
Channel Occupancy Time and Idle Period Time follow as IEEE 802.11™-2012 and IEEE 802.15.4™-2011 specification without restirction.							

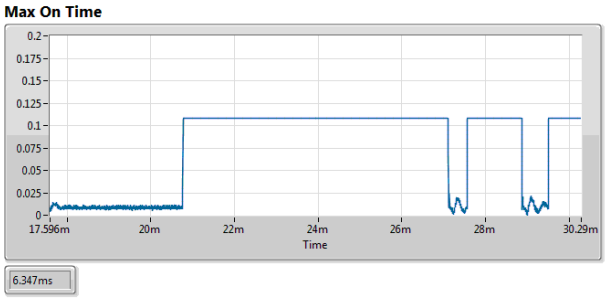
5.1.6 Test Result of Adaptivity Time Plots

Adaptivity & Receiver Blocking Result Time Plots	
11b – 2412MHz - Channel Occupancy Time	11b – 2412MHz - Idle Period Time
	
11b – 2412MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s	
	
11b – 2412MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	11b – 2412MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

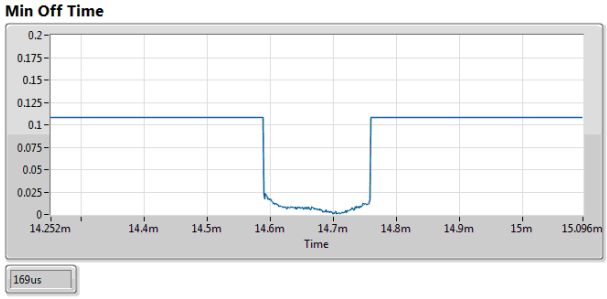
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

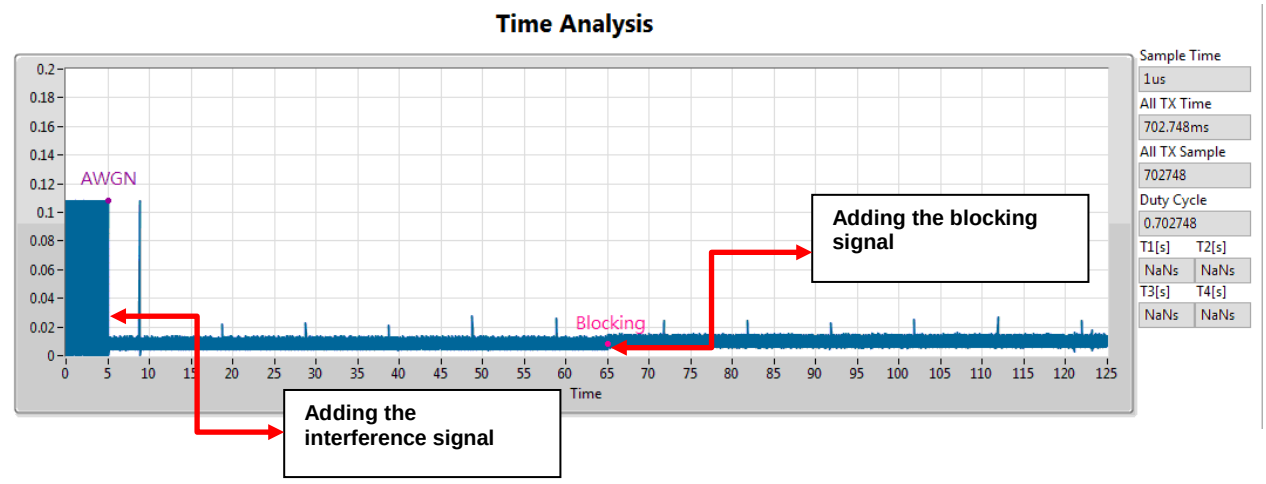
11b – 2472MHz - Channel Occupancy Time



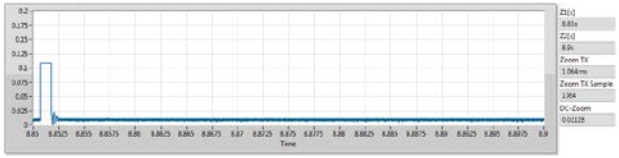
11b – 2472MHz - Idle Period Time



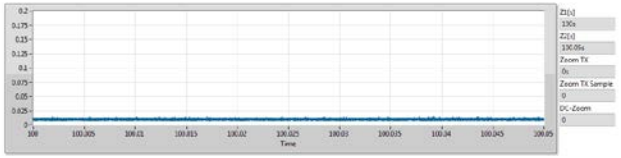
11b – 2472MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



11b – 2472MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms

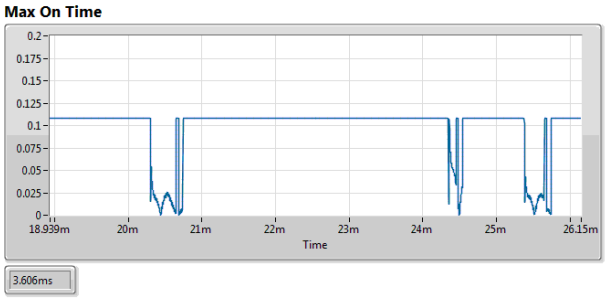
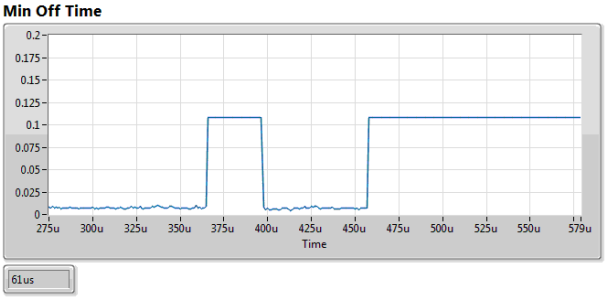


11b – 2472MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms

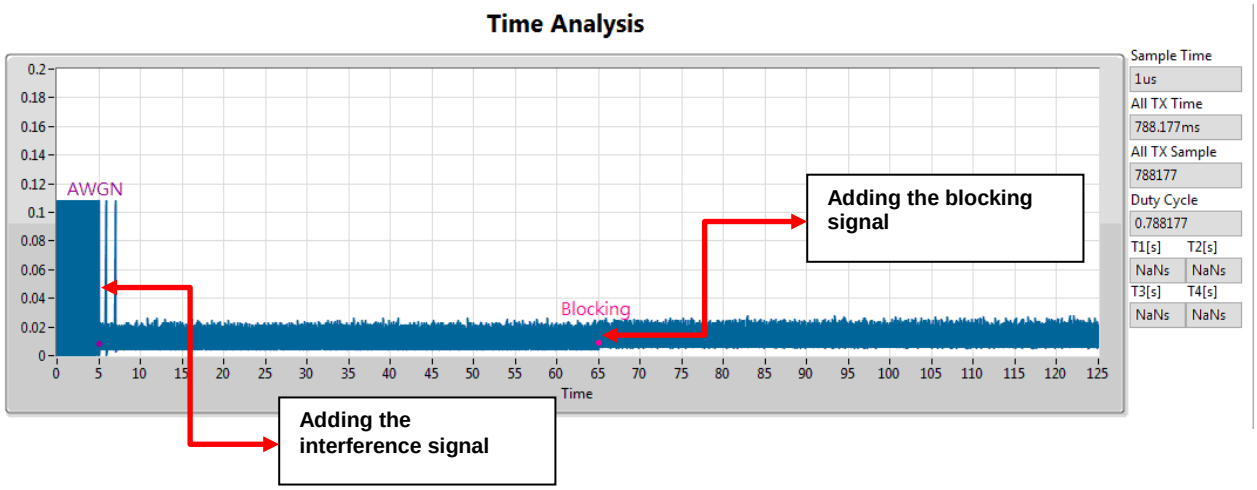


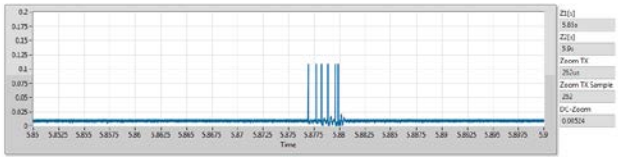
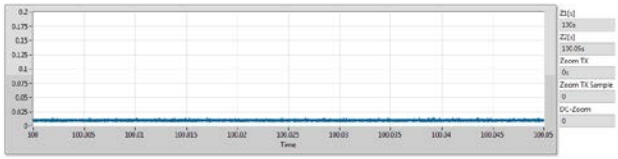
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

11g – 2412MHz - Channel Occupancy Time	11g – 2412MHz - Idle Period Time
	

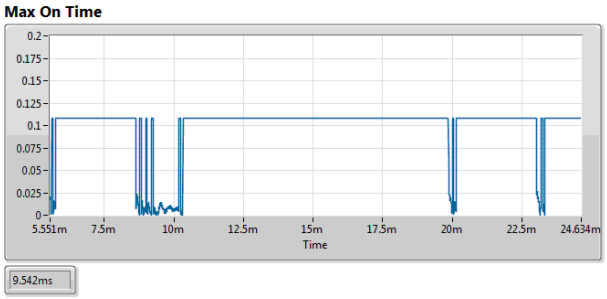
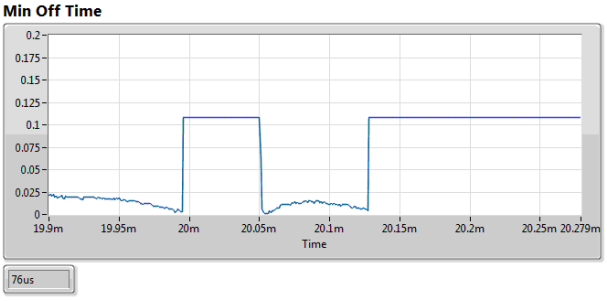
11g – 2412MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



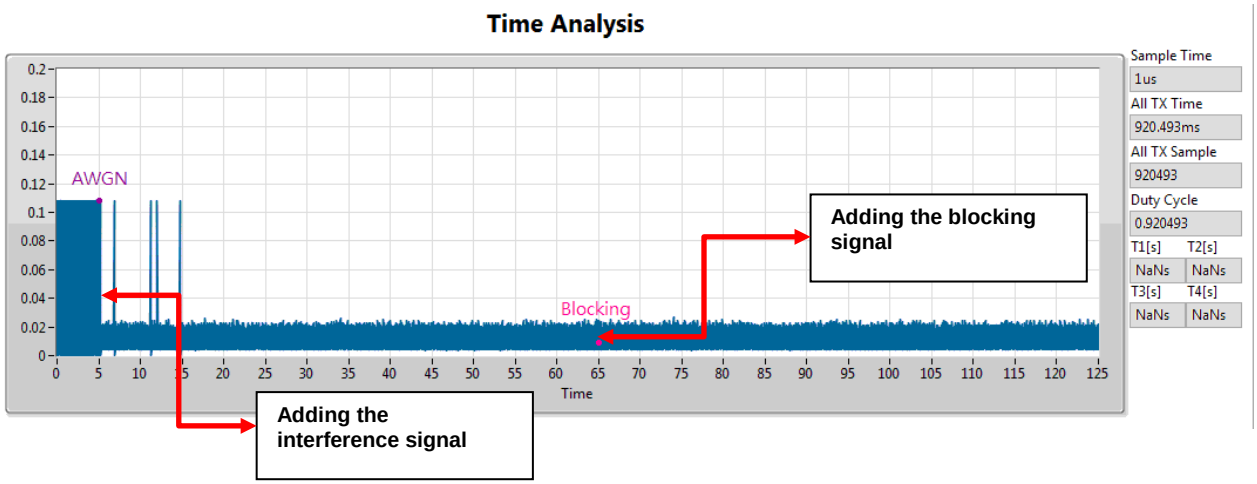
11g – 2412MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	11g – 2412MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

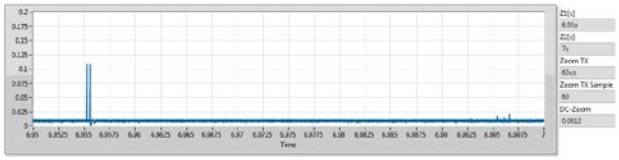
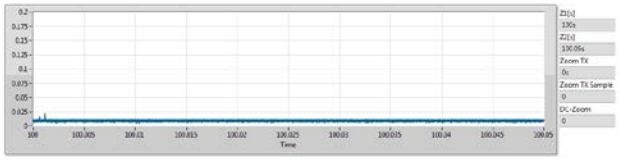
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

11g – 2472MHz - Channel Occupancy Time	11g – 2472MHz - Idle Period Time
	

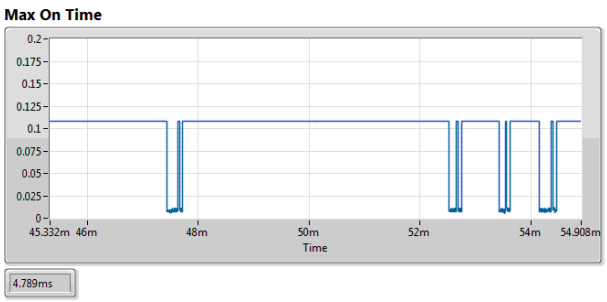
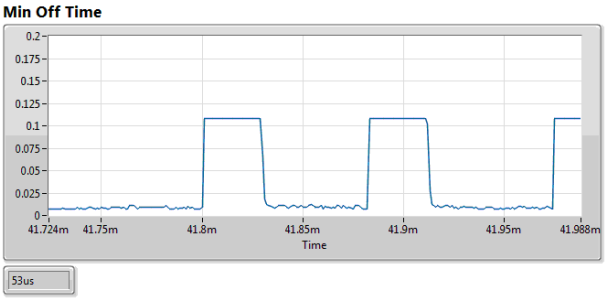
11g – 2472MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



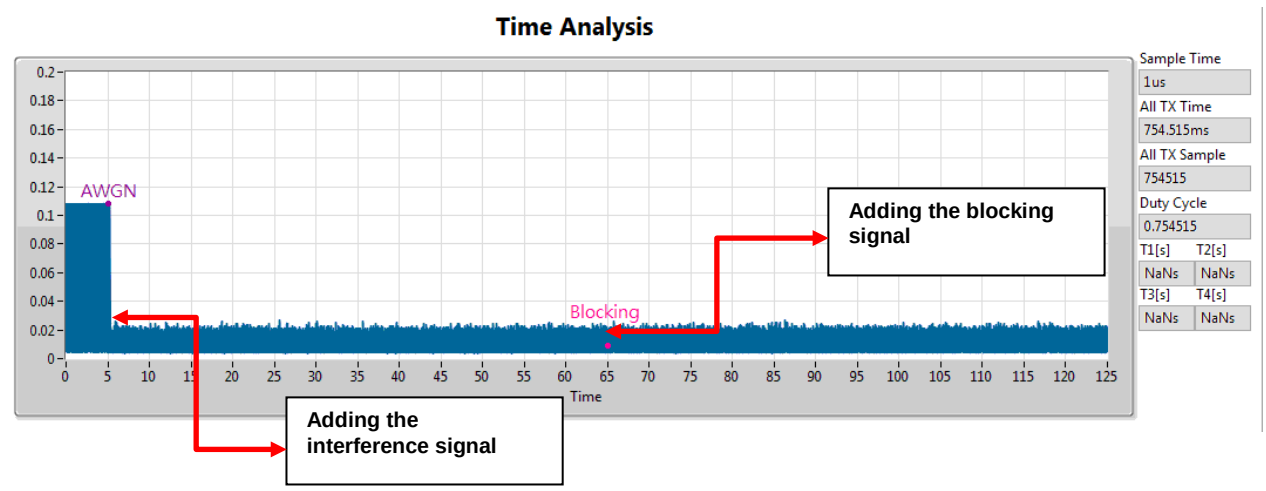
11g – 2472MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	11g – 2472MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

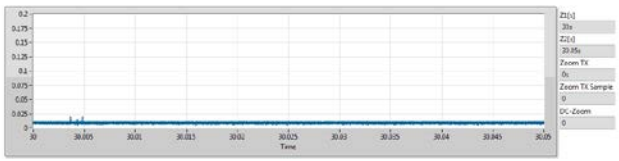
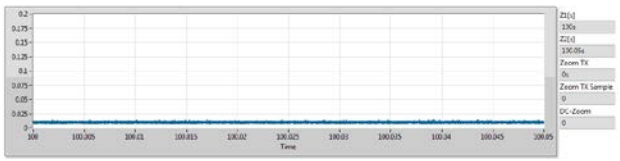
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

HT20 – 2412MHz - Channel Occupancy Time	HT20 – 2412MHz - Idle Period Time
	

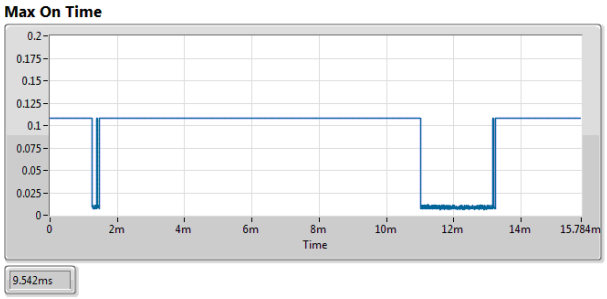
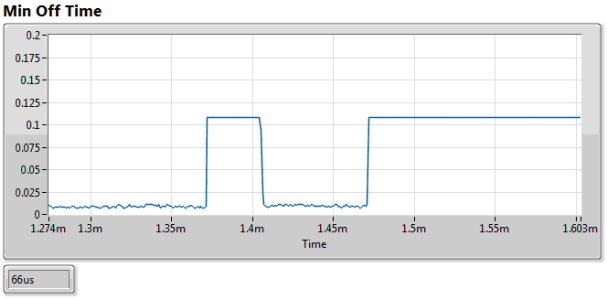
HT20 – 2412MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



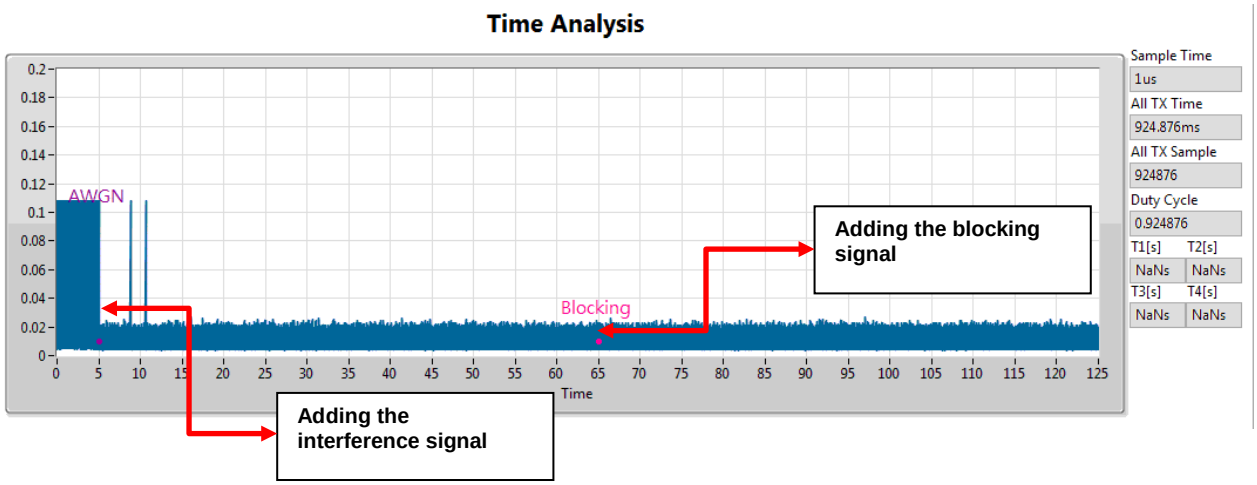
HT20 – 2412MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	HT20 – 2412MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

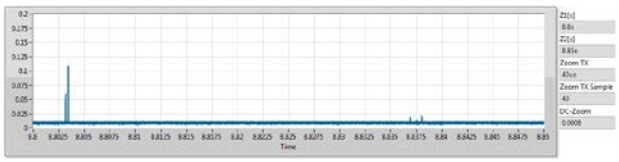
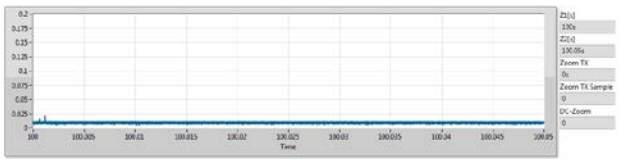
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

HT20 – 2472MHz - Channel Occupancy Time	HT20 – 2472MHz - Idle Period Time
	

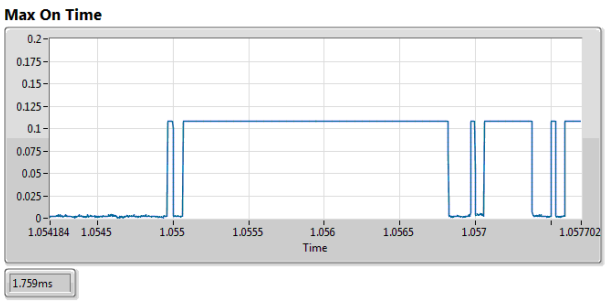
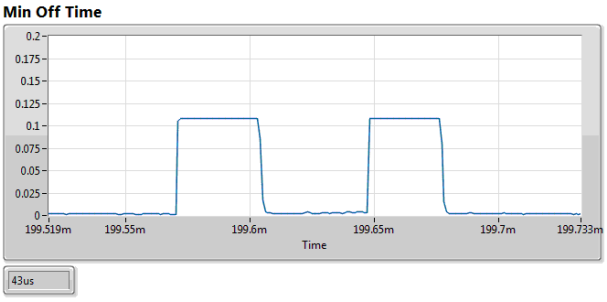
HT20 – 2472MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



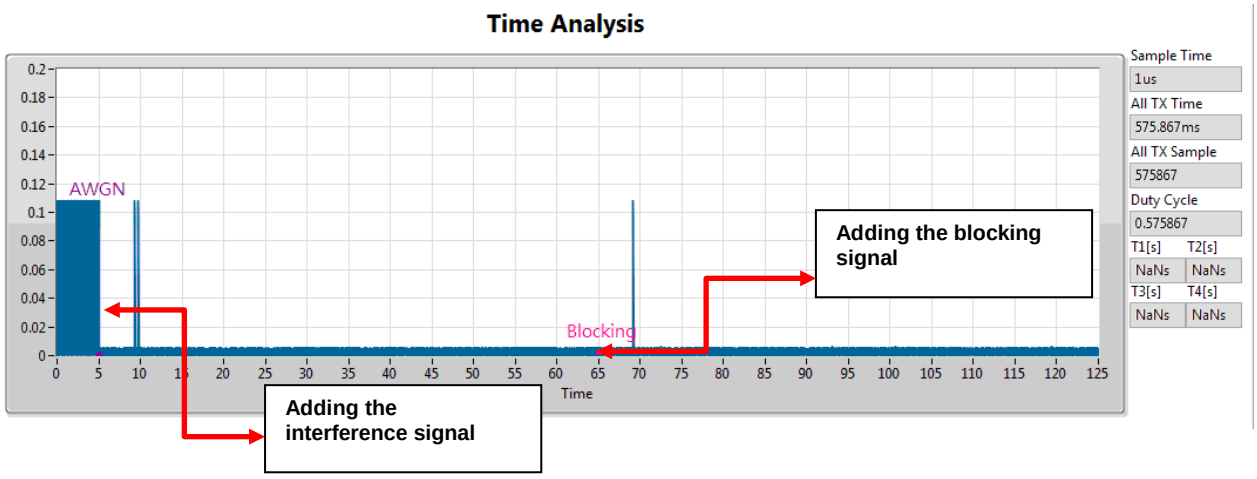
HT20 – 2472MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	HT20 – 2472MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

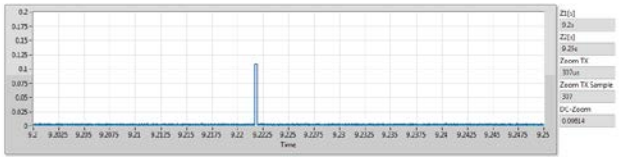
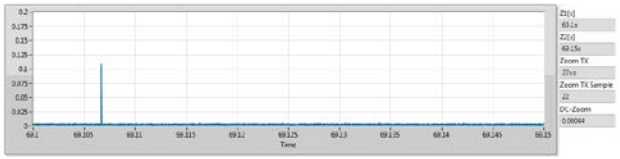
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

HT40 – 2422MHz - Channel Occupancy Time	HT40 – 2422MHz - Idle Period Time
	

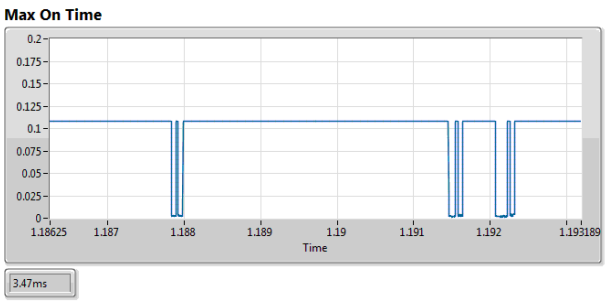
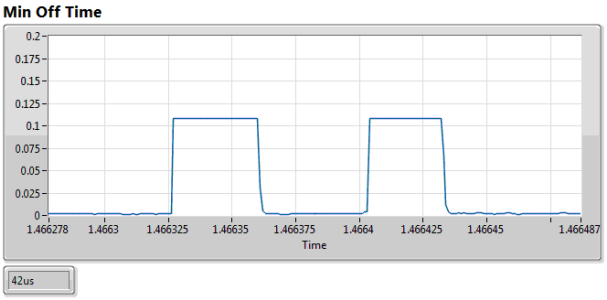
HT40 – 2422MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



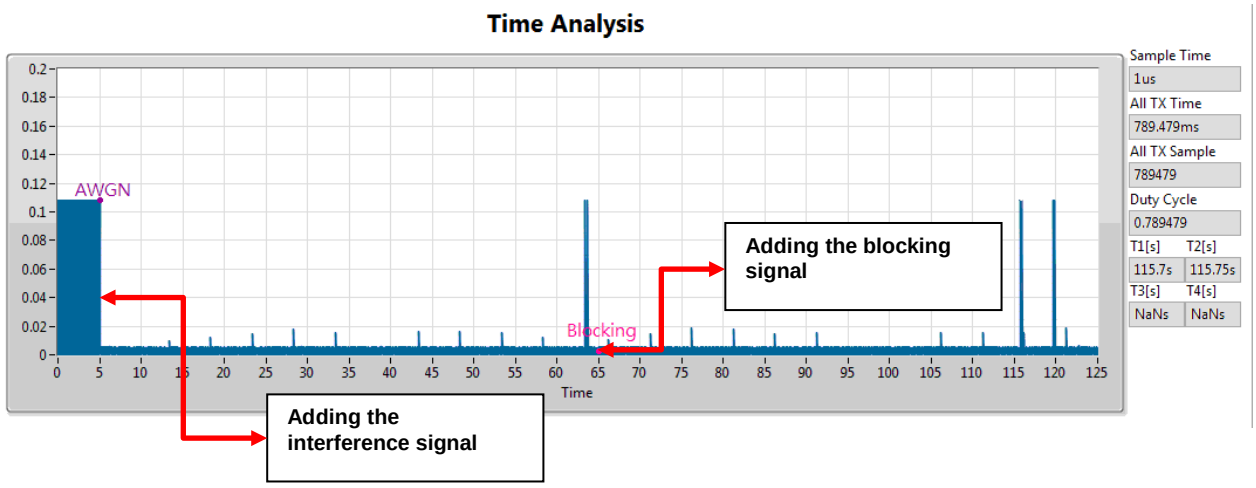
HT40 – 2422MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	HT40 – 2422MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

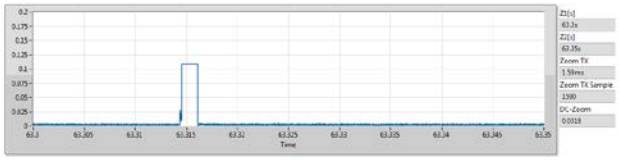
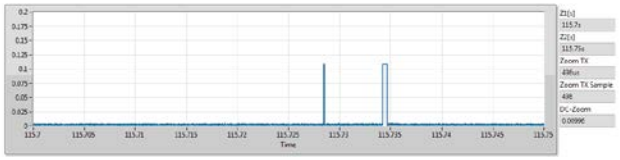
Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

Adaptivity & Receiver Blocking Result Time Plots

HT40 – 2462MHz - Channel Occupancy Time	HT40 – 2462MHz - Idle Period Time
	

HT40 – 2462MHz - Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 120s



HT40 – 2462MHz - Worse Adaptivity Short Control Signaling Transmissions - 50ms	HT40 – 2462MHz - Worse Adaptivity & Receiver Blocking Short Control Signaling Transmissions - 50ms
	

Note : In the plots of Short Control Signalling Transmissions, inject the interference signal to the EUT at the beginning..

6 Test Equipment and Calibration Data

< RF Conducted >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 06, 2015	May 05, 2016
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Apr. 07, 2015	Apr. 06, 2016
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 28, 2015	Jul. 27, 2016
4 Port switch	CEI	P4R-720120	TH01	1GHz~26.5GHz	Jul. 01, 2015	Jun. 30, 2016
Power Meter	Agilent	U2021XA	MY54320011	50MHz~18GHz	Aug. 17, 2015	Aug. 16, 2016
Power Meter	Agilent	U2021XA	MY54320013	50MHz~18GHz	Aug. 17, 2015	Aug. 16, 2016

< Radiated Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101514	10Hz ~ 40GHz	Sep. 16, 2015	Sep. 15, 2016
Amplifier	Agilent	8447D	2944A11146	0.1M ~ 1.3G	Sep. 16, 2015	Sep. 15, 2016
Amplifier	EMCI	EMC051845BE	980241	1GHz ~ 18GHz	Mar. 09, 2015	Mar. 08, 2016
Bilog Antenna	SCHAFFNER	CBL6111C	2737	25MHz ~ 1GHz	Sep. 18, 2015	Sep. 17, 2016
Horn Antenna	COM-POWER	AH-118	10094	1GHz ~ 18GHz	May 21, 2015	May 20, 2016

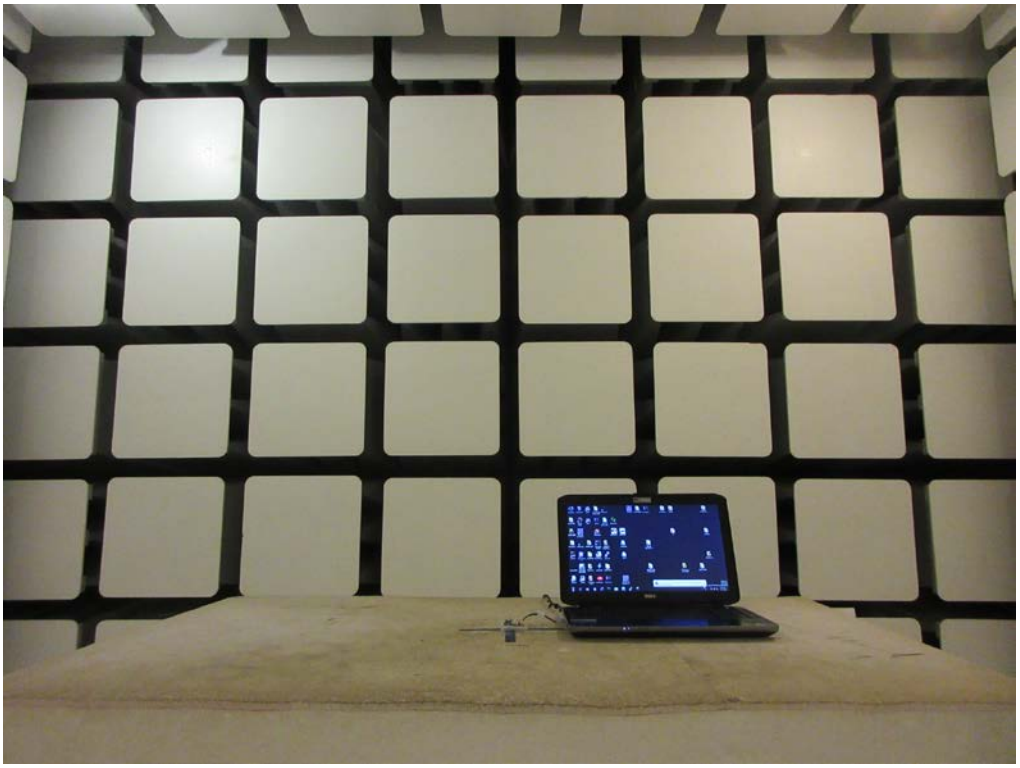
< Adaptivity Site>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Signal generat	Agilent	E4438C	MY49072778	250kHz-6GHz	Oct. 03, 2014	Oct. 02, 2015
Vector Signal Generator	Keysight	N5171B	MY53051240	9KHz ~ 6GHz	Jun. 18, 2015	Jun. 17, 2016
Spectrum Analyzer	Keysight	N9010A	MY55150165	9KHz~7GHz	Jun. 22, 2015	Jun. 21, 2016
USB Scope	NATIONAL INSTRRUMENTS	USB-5133	F4D0D4	100MHz	Aug. 25, 2015	Aug. 24, 2016
Amplifier	EMCI	EMC9135	980232	10KHz ~ 1000MHz	Jan. 27,2015	Jan. 26,2016

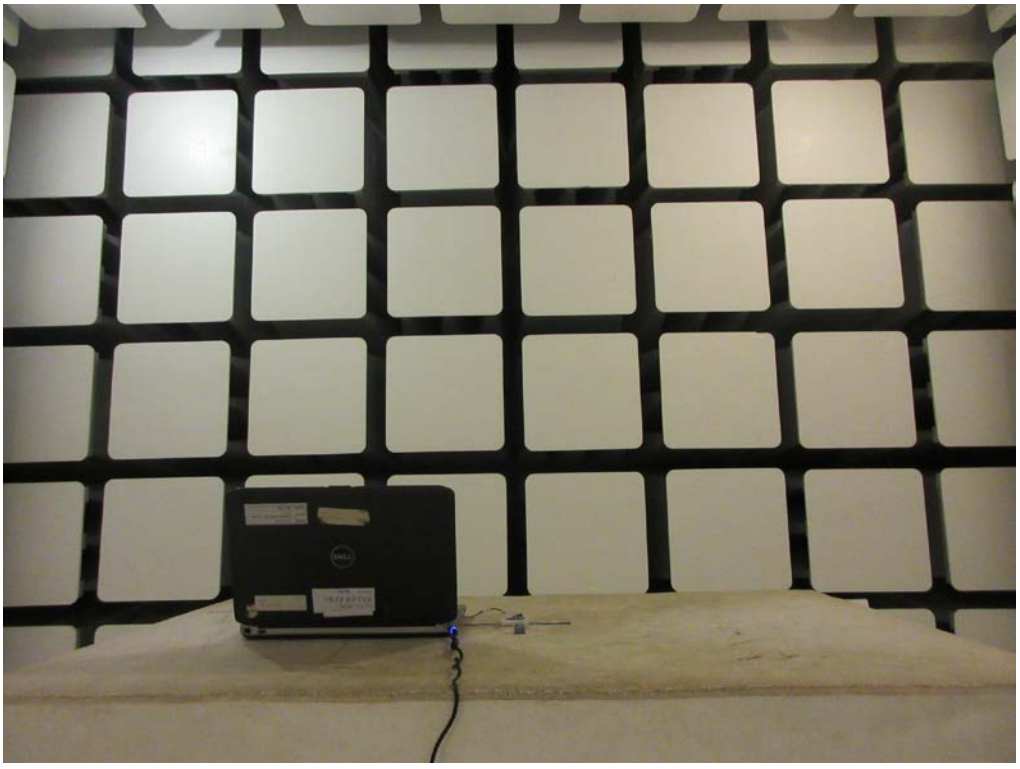
Appendix A. Test Photos

1. Photographs of Radiated Emissions Test Configuration

Front view

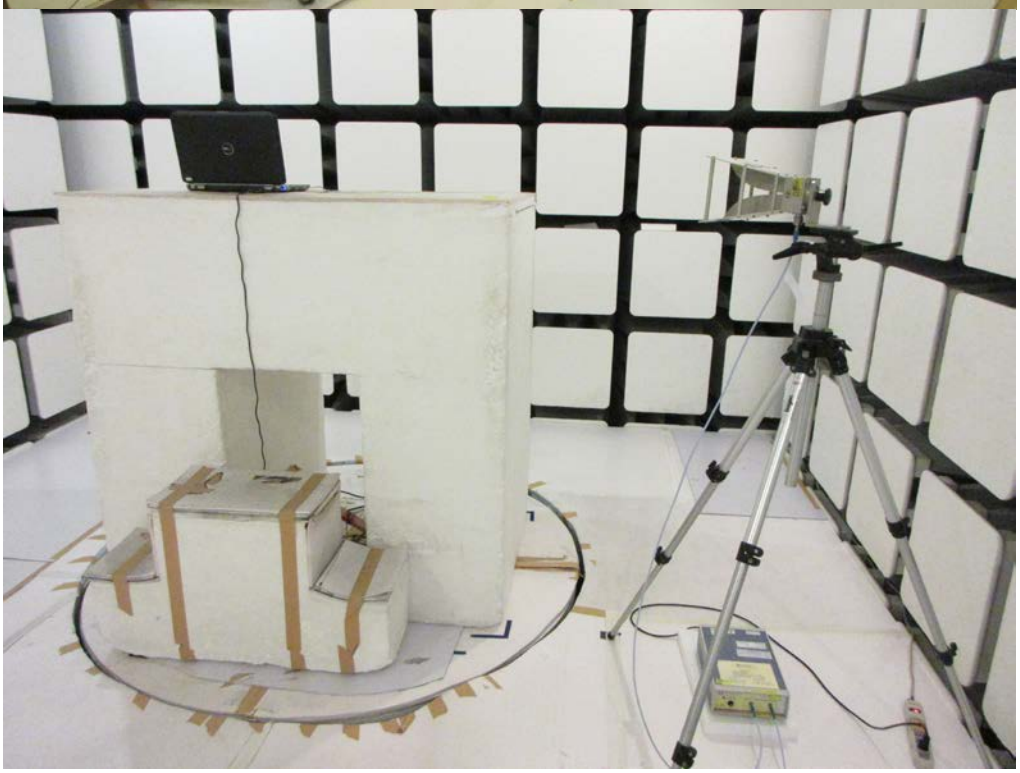


Rear view

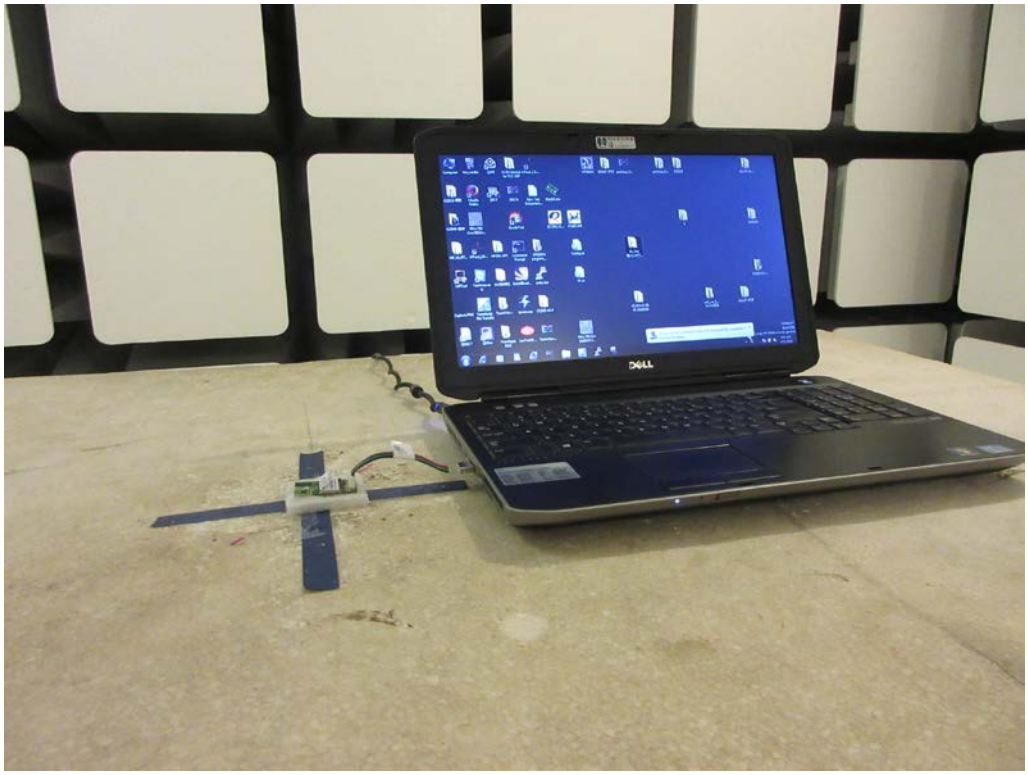


Below 1GHz

Above 1GHz



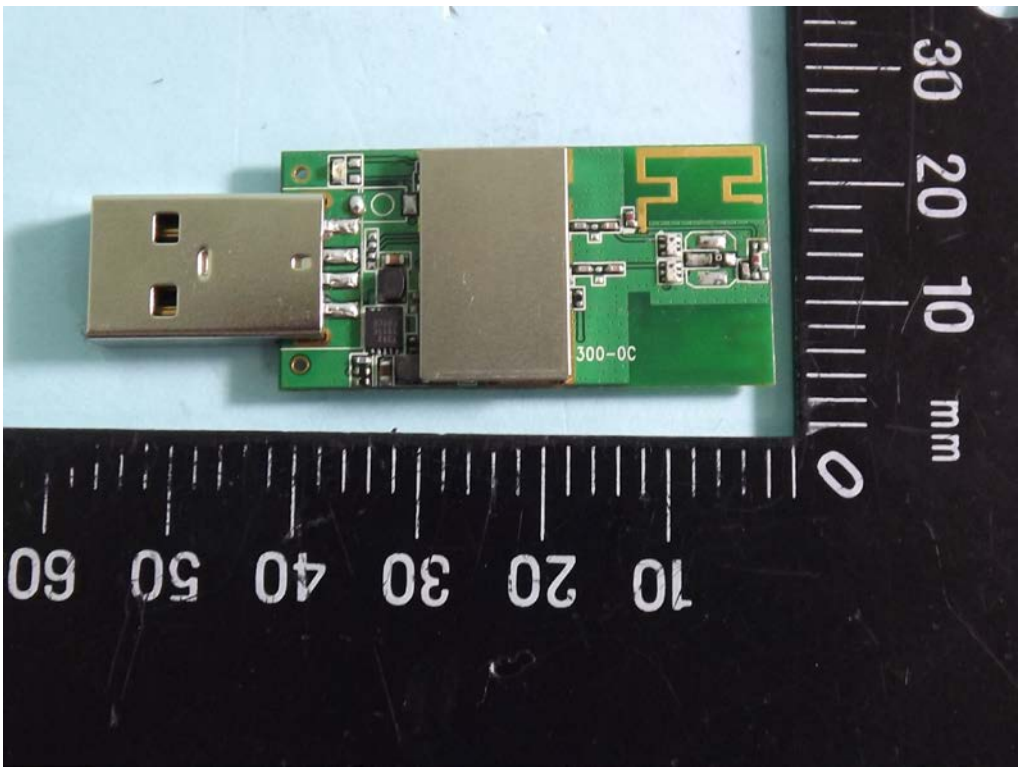
EUT took a close view

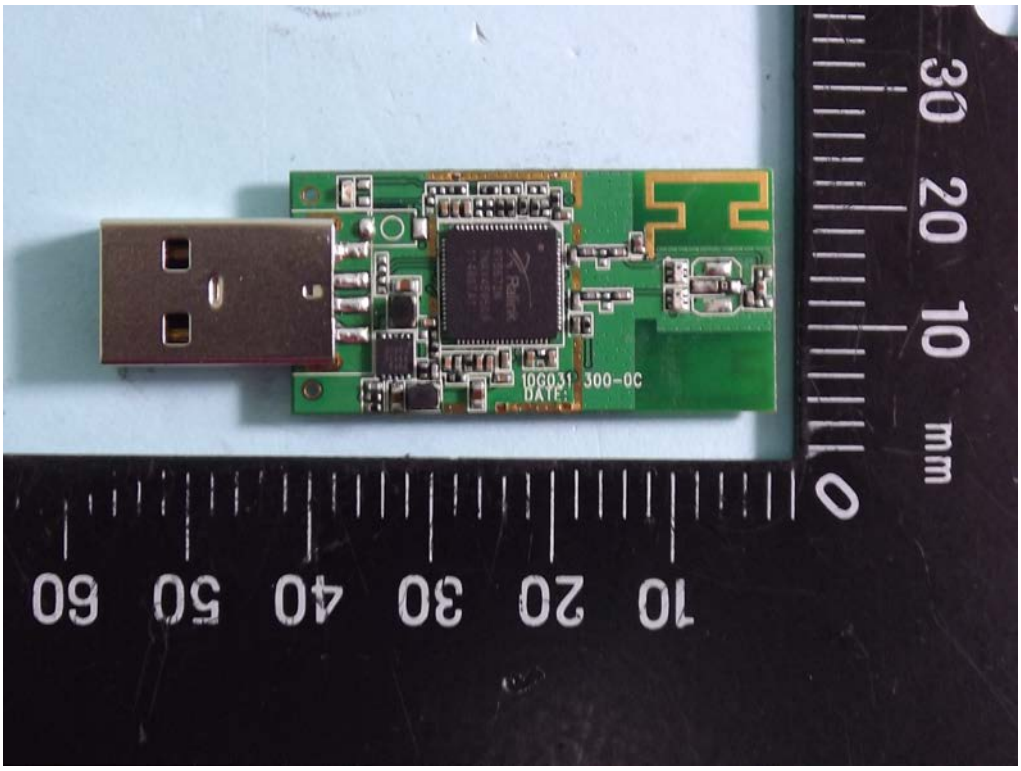


2. Photographs of Adaptivity Test Configuration

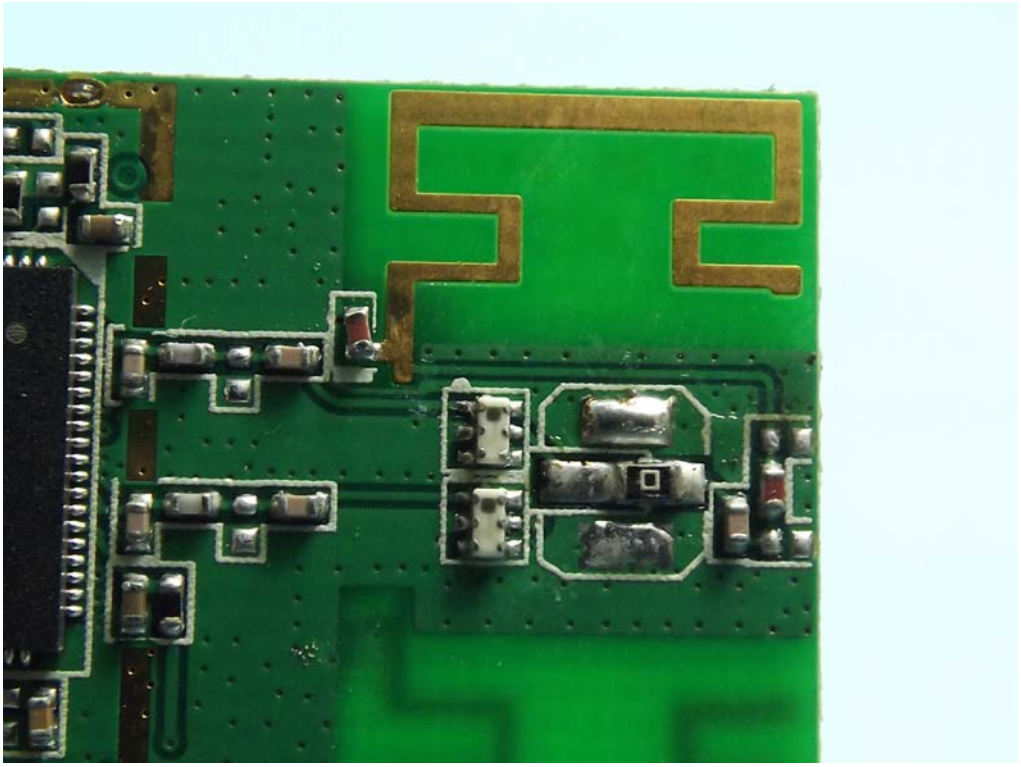
APPENDIX B. Photographs of EUT

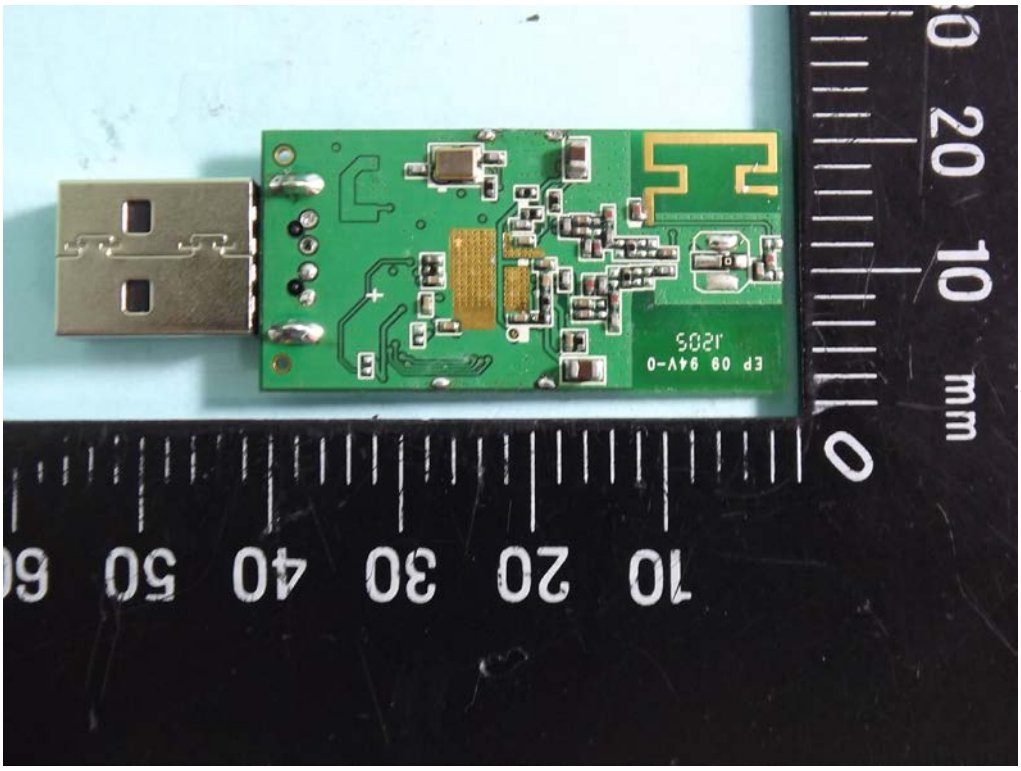
Printed Ant. + USB

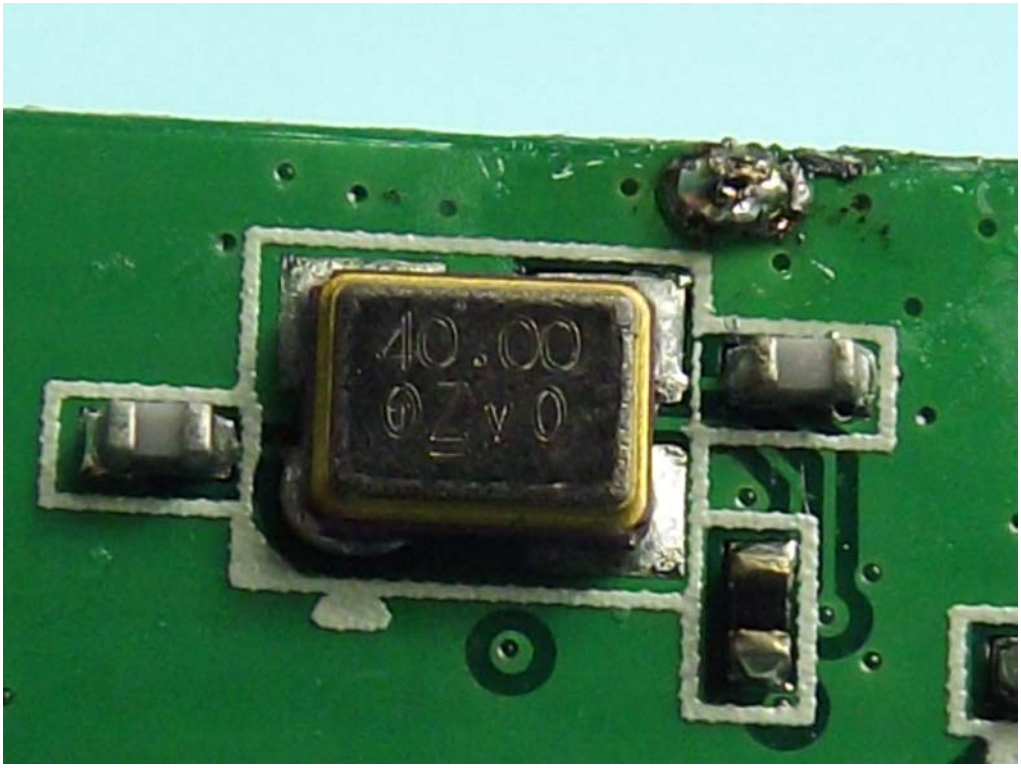


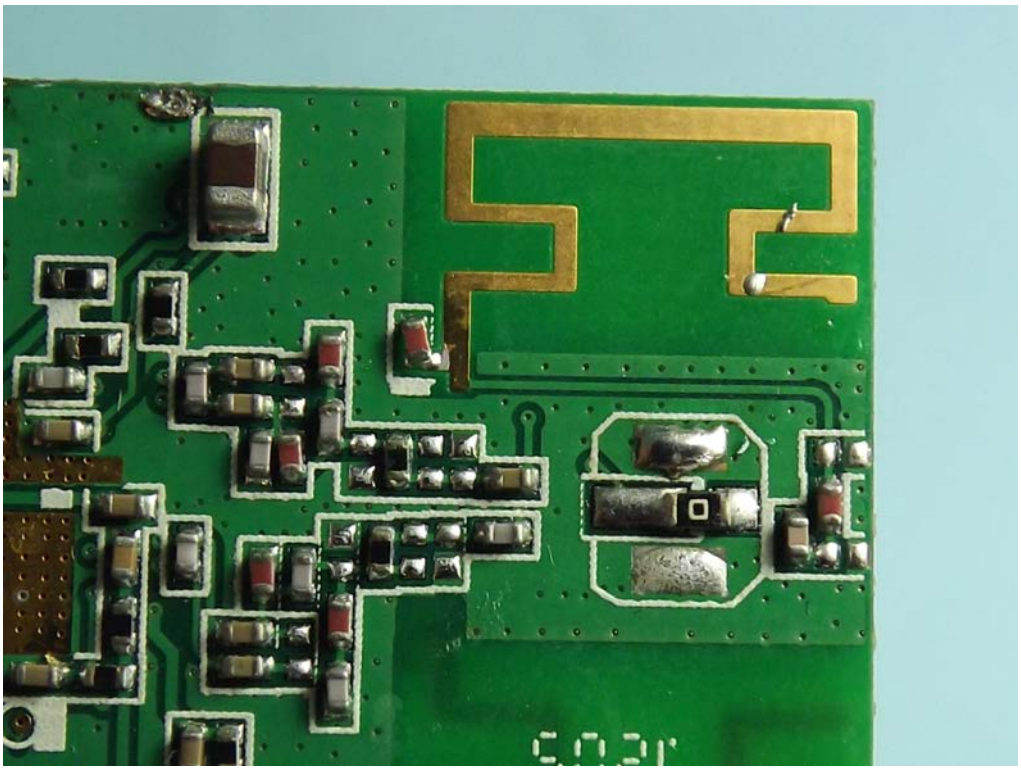



Ralink
RT5572N
TNAV458509
1148STA1

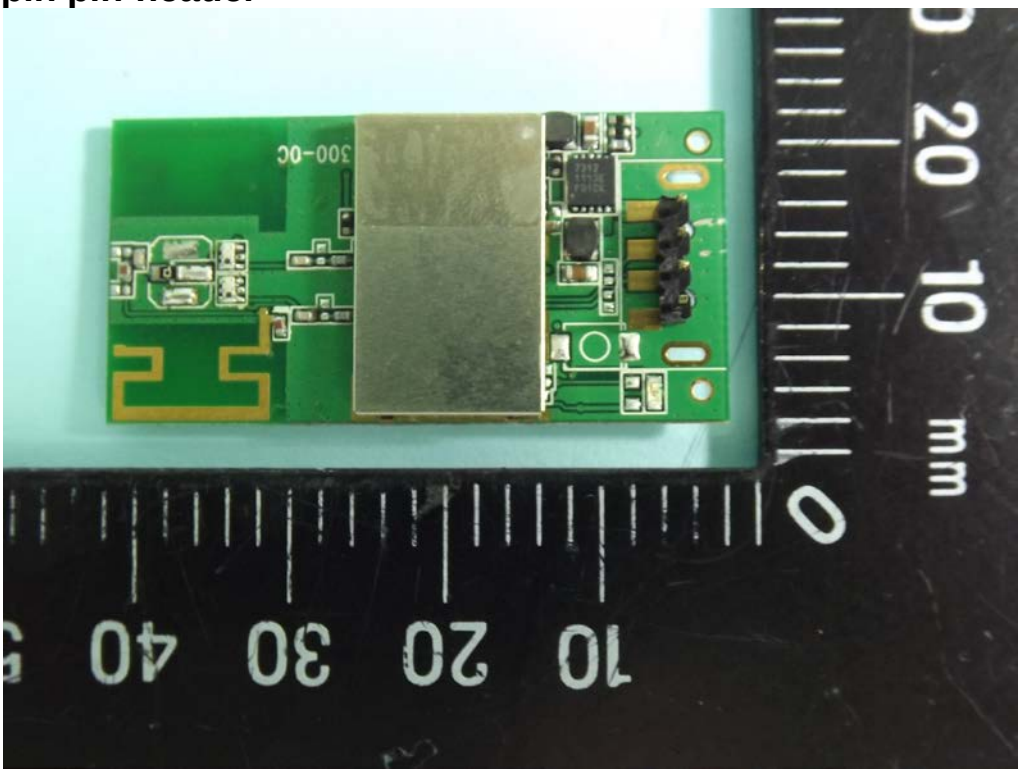


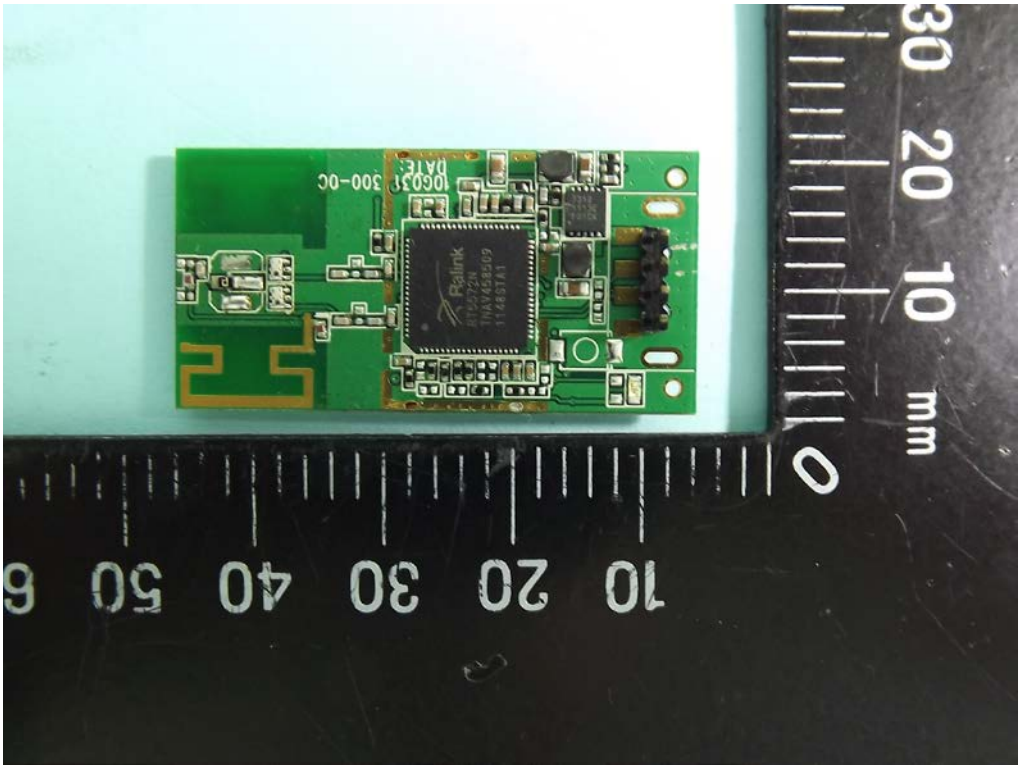

0 20 10 mm
10 20 30 40 50 6


40.00

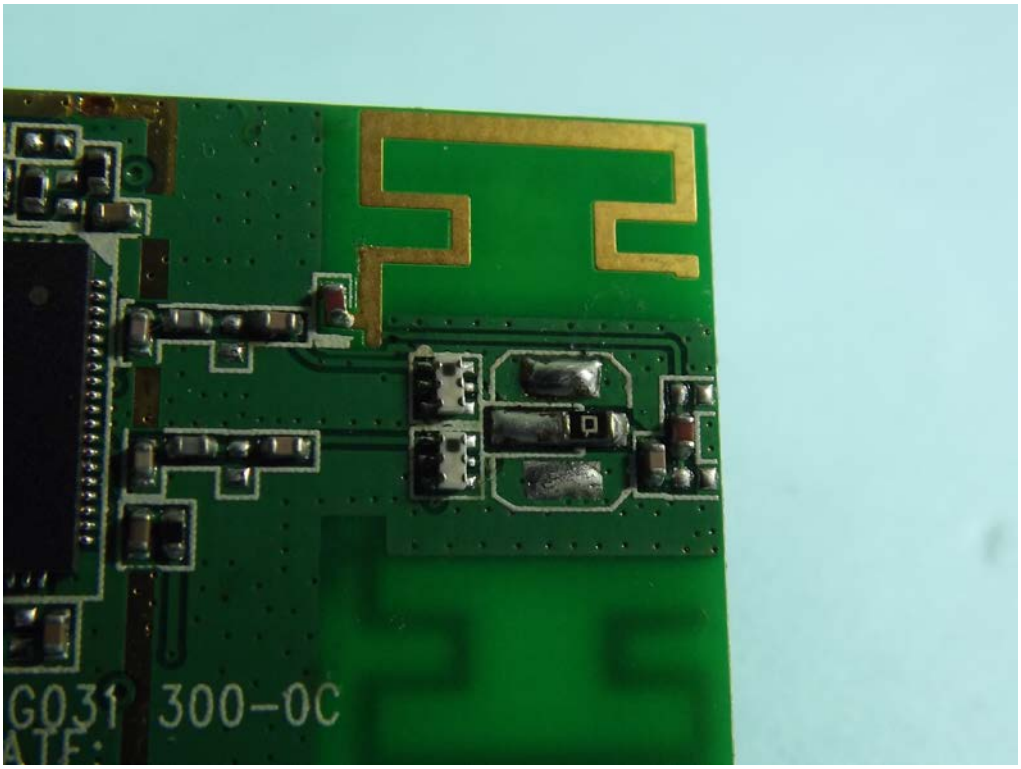


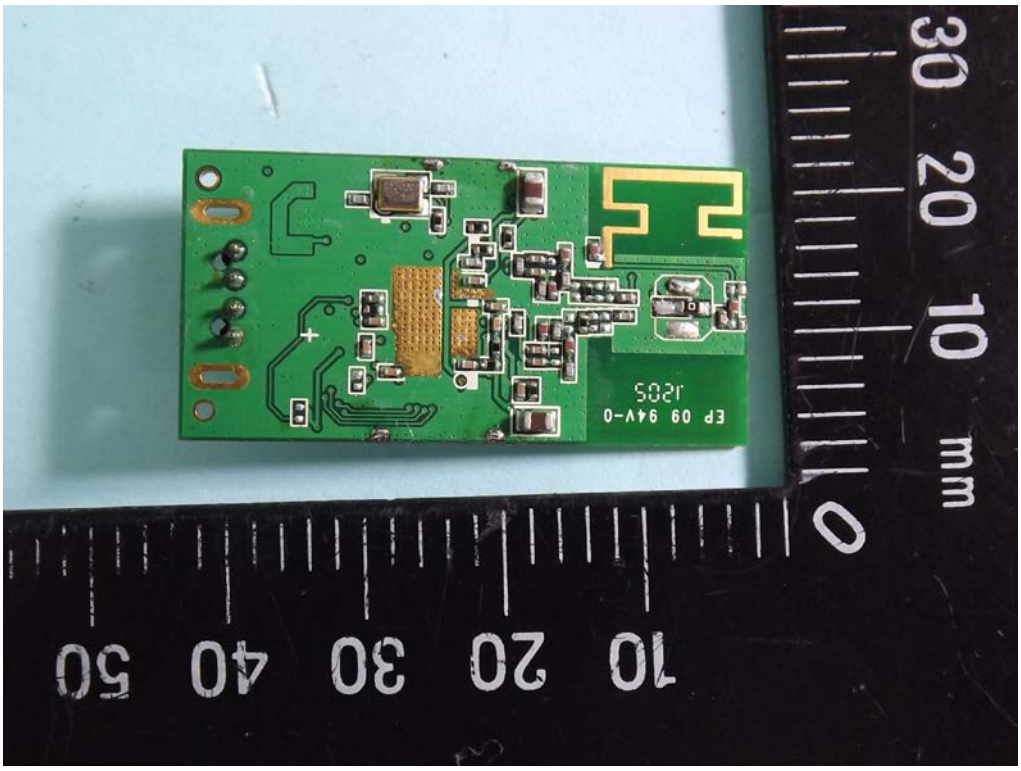
Printed Aut. + 4pin pin-header

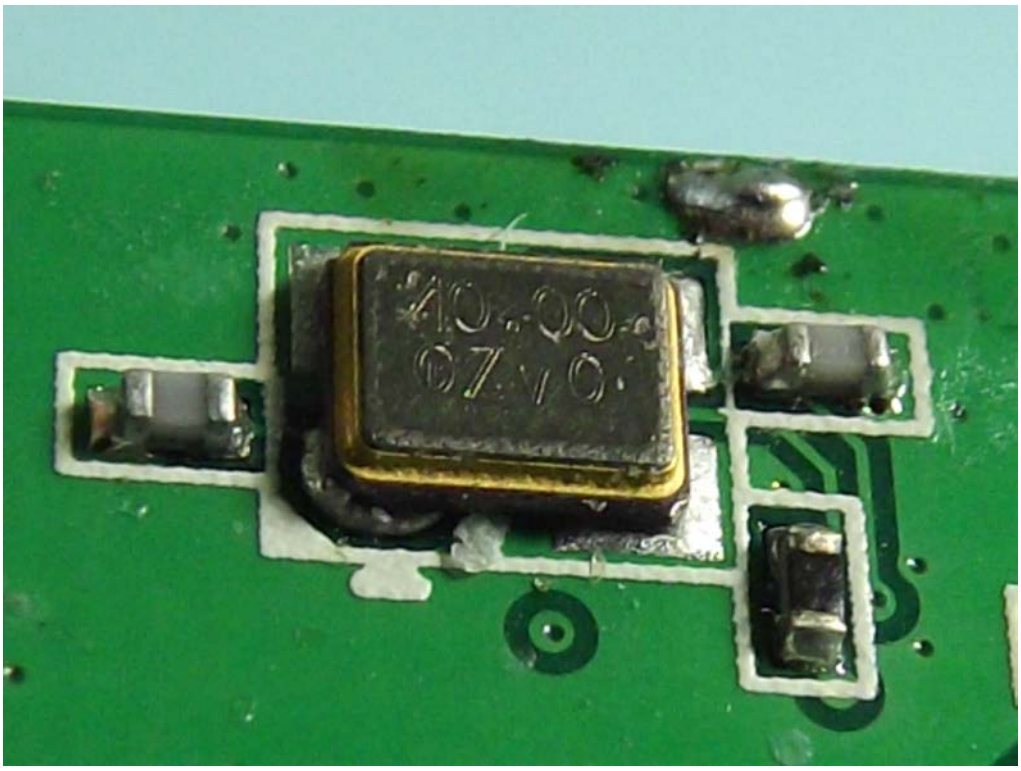


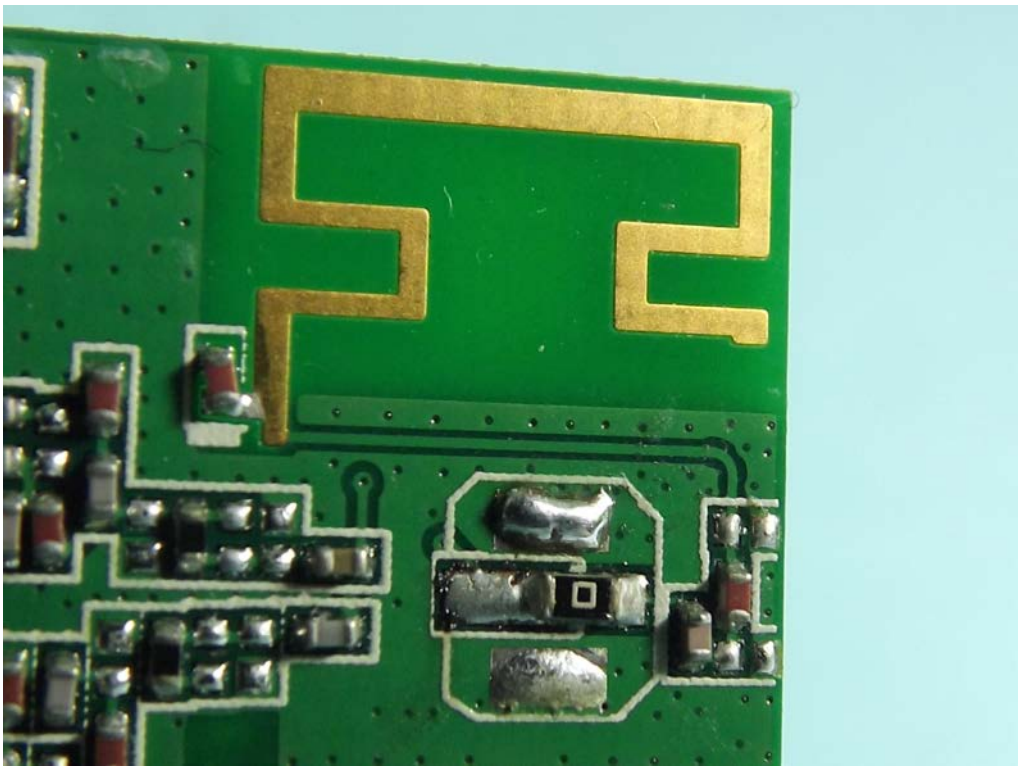



Ralink
RT5572N
TNAV458509
1148STA1
10G031
DATE:

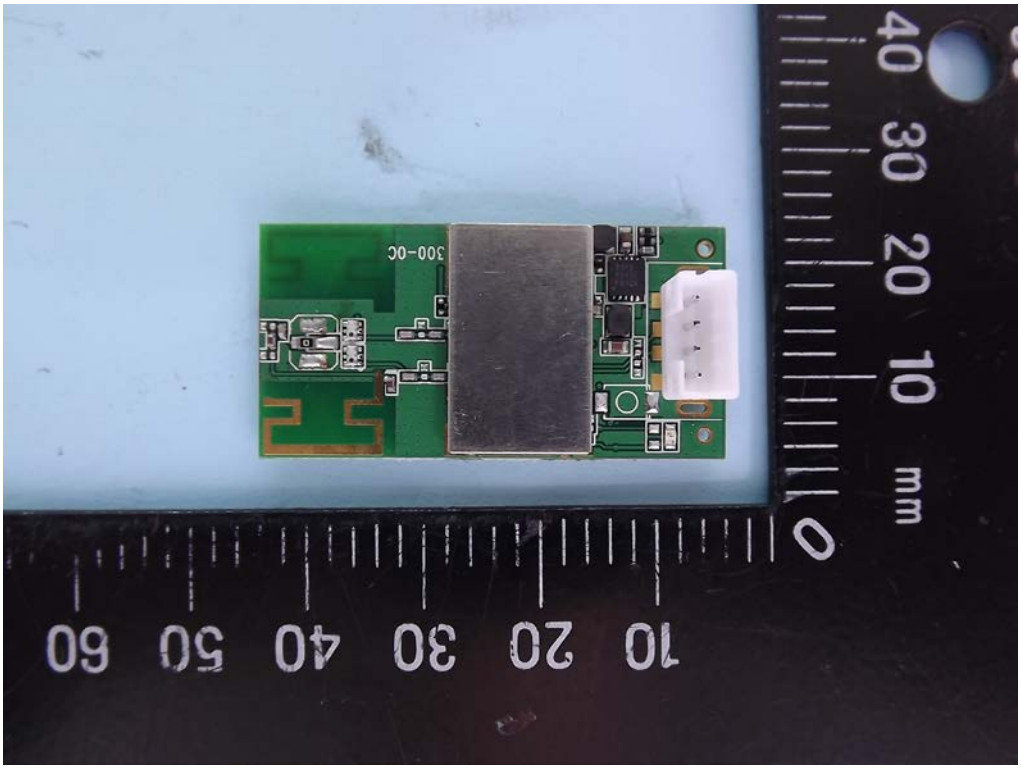

G031 300-0C

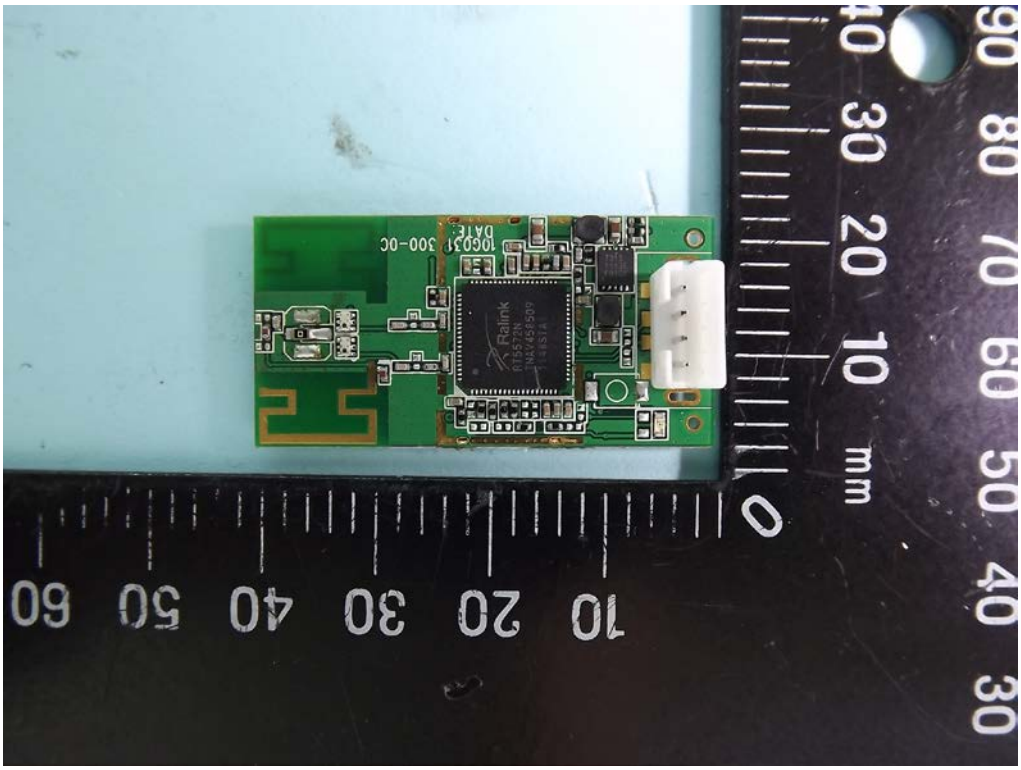

30 20 10 0 mm
10 20 30 40 50

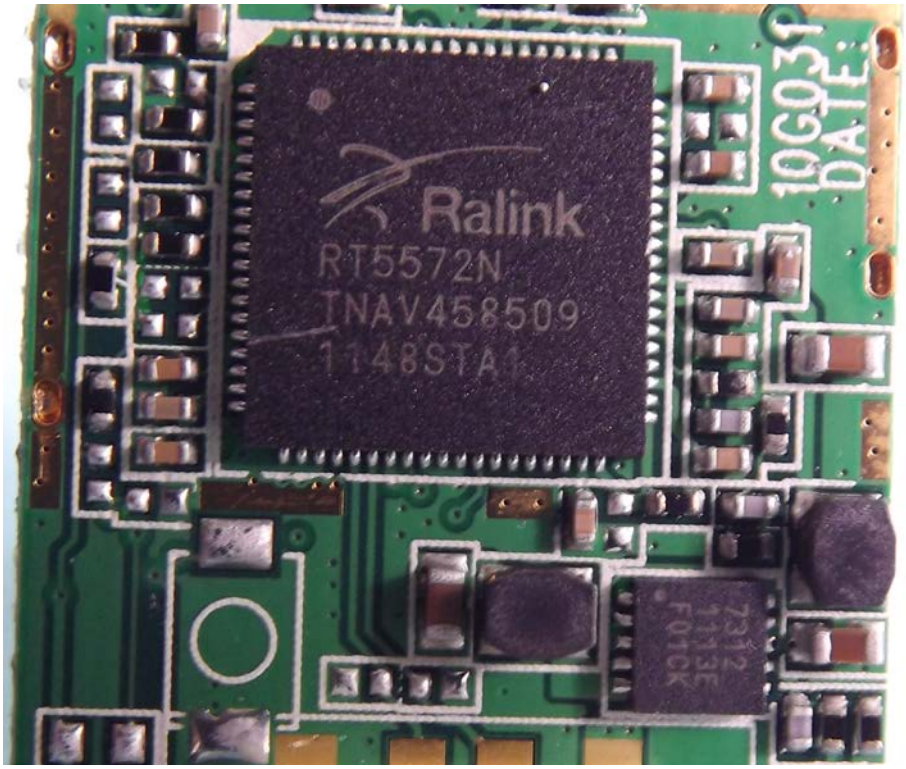


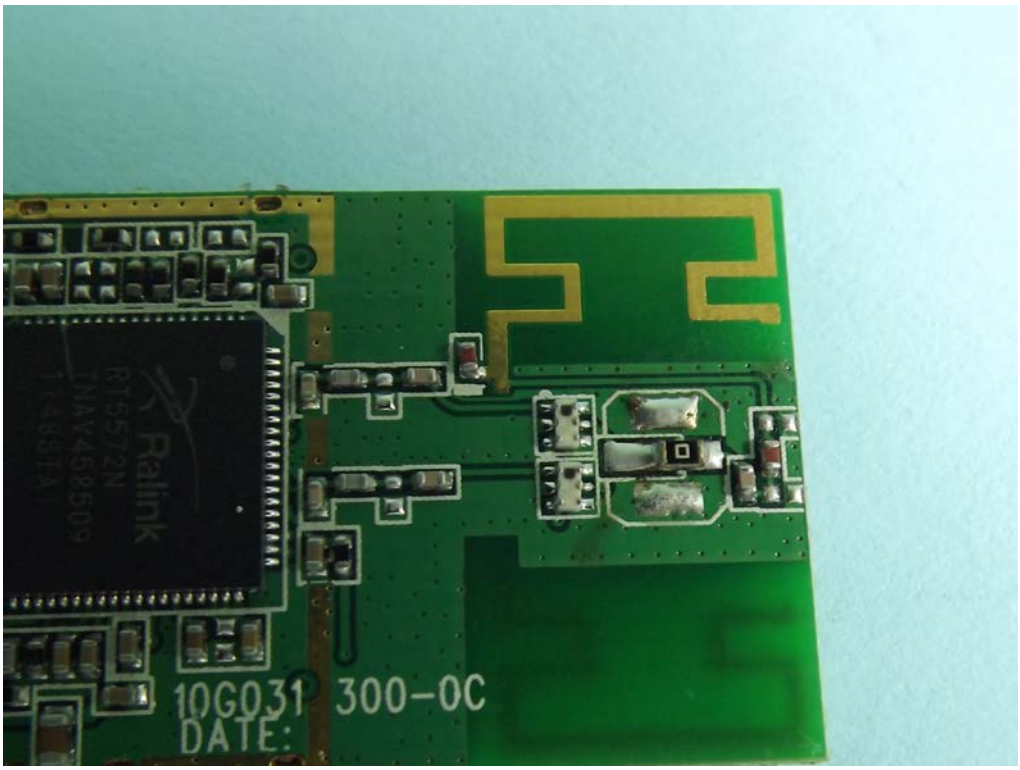


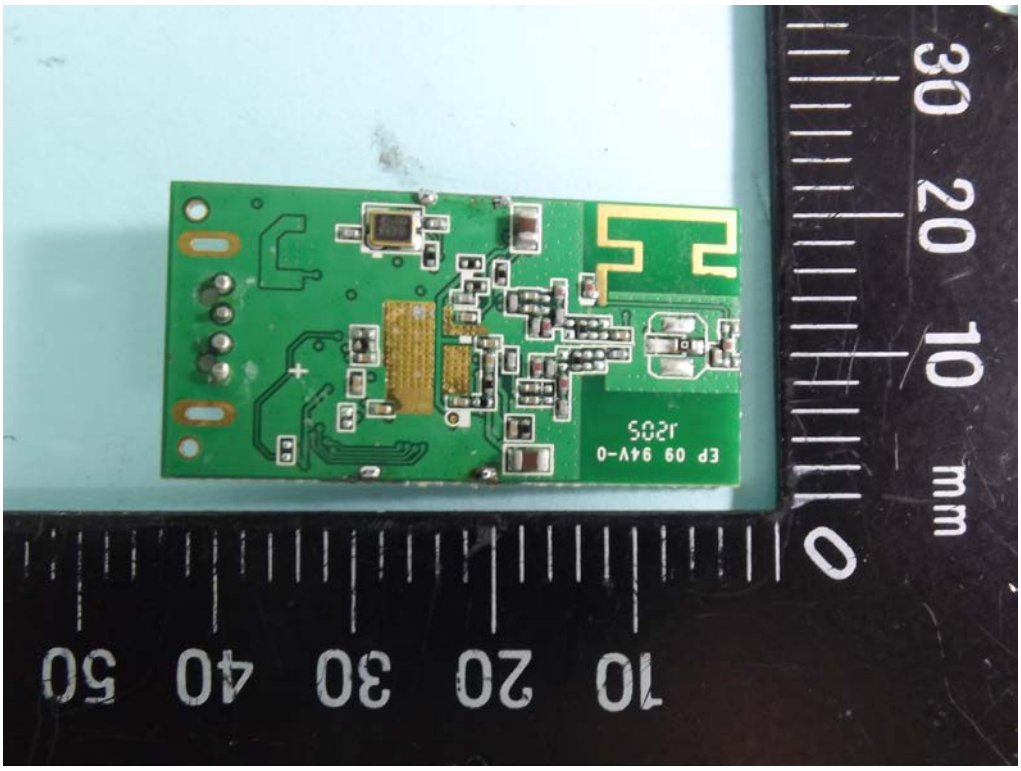
Printed Aut. + 4pin wafer con

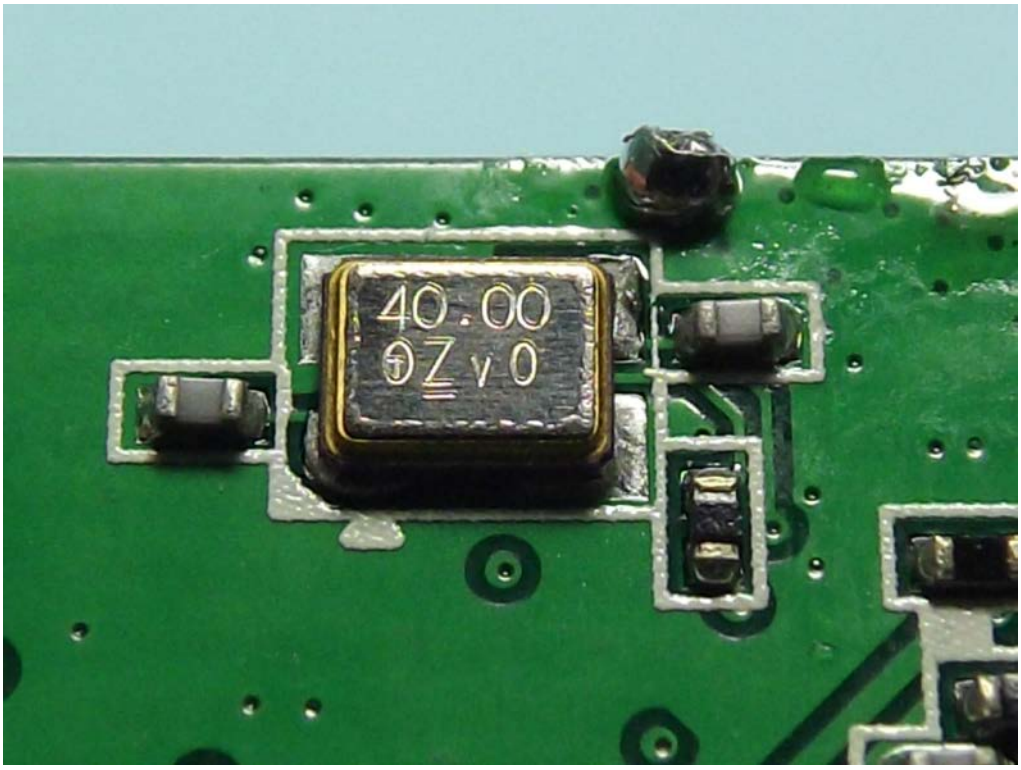





Ralink
RT5572N
INAV458509
1148STA1
10G031
DATE:


Ralink
10G031 300-0C
DATE:


30 20 10 0 mm
10 20 30 40 50


40.00